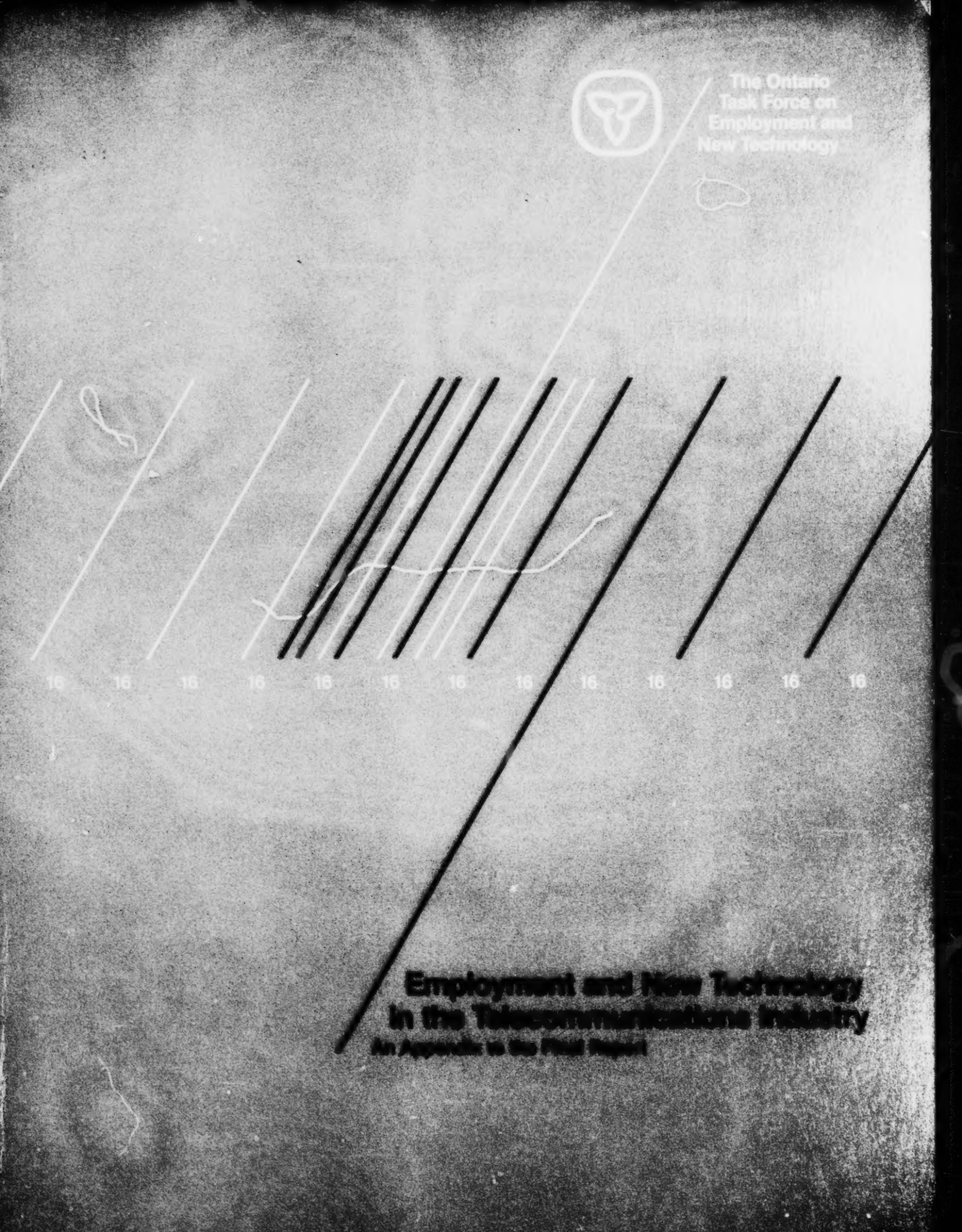

The Ontario Task Force on Employment and New Technology

Employment and New Technology in the Telecommunications Industry

An Appendix to the Final Report

86-03663/

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

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APPENDIX 16

EMPLOYMENT AND NEW TECHNOLOGY

IN THE TELECOMMUNICATIONS INDUSTRY

This Appendix contains a report prepared for the Ontario Task Force on Employment and New Technology. The topic was approved in advance by the Task Force. At the conclusion of the study, the Task Force had the opportunity to review the report, but its release does not necessarily imply endorsement of the results by the Task Force or its individual members.

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FOREWORD

The Ontario Task Force on Employment and New Technology, a joint labour-management group, was established in May, 1984, "to consider and report on the manpower and employment implications of new technologies as the same may be introduced and applied in Ontario during the next decade and the extent and nature thereof."

To inform its discussions, the Task Force established a research agenda designed to gather information on employment and technological change from a wide variety of sources. The research agenda contained projects which gathered information of a historical nature, and projects with a future orientation which were designed to gather information describing likely occupational and employment implications associated with technological change in the 1985-1995 period.

The Appendices to the Final Report of the Ontario Task Force on Employment and New Technology contain reports of these research projects. A complete list of these Appendices may be found at the end of this document.

Among the Appendices are reports of a series of studies to assess the extent and nature of the employment implications of new technology in selected industries in Ontario. Appendix 3 describes the process by which the industries were selected, and contains the studies' terms of reference which called for particular attention to selected new technologies and occupational groups. Appendices 4-18 contain reports of these industry studies, which were conducted by Currie, Coopers & Lybrand, management consultants.

This particular appendix contains a report of the study on the Telecommunications Industry.

Dr. Richard L. E. Brown, P.Eng.
Research Director

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The Board of Industrial Leadership and Development (BILD) of the Government of Ontario.

The Ontario Manpower Commission.

The Ontario Ministry of Labour.

The Task Force would like to thank the staff of Currie, Coopers & Lybrand, particularly Maureen Farrow and Victor Rocine, whose assistance in the conduct of this study is greatly appreciated.

Special thanks are due to all industry experts and survey respondents who provided information for this study.

EMPLOYMENT AND NEW TECHNOLOGY IN THE TELECOMMUNICATIONS INDUSTRY

A Report Prepared by Currie, Coopers & Lybrand
for the Consideration of the Ontario Task Force
on Employment and New Technology

July 1985

Submitted By: Maureen Farrow

Currie, Coopers
& Lybrand
Management
Consultants

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EMPLOYMENT AND NEW TECHNOLOGY IN THE TELECOMMUNICATIONS INDUSTRY

PART I - INTRODUCTION AND METHODOLOGY

1.0 INTRODUCTION

This report is one of a series of industry reports which summarize the findings of a major research project[1] undertaken for the Ontario Task Force on Employment and New Technology. Each report includes a historical analysis and an outlook to 1995 for the industry, and a review of the anticipated impacts of new technology on employment.

1.1 Structure of This Report

This report presents the study findings for Ontario's Telecommunications Industry (SIC 544 and SIC 545).[2] Telephone Systems (SIC 544) is discussed under Section I followed by Telegraph and Cable Systems (SIC 545) in Section II of the report.

The report includes four parts.

- The first part (Chapter 1.0) is the Introduction which includes a description of the approach and methodology.
- The second part (Chapter 2.0) is a Historical Analysis for the industry from 1971 to 1984 which provides background and a perspective on the industry's historical development.
- The third part (Chapters 3.0 to 7.0) discusses the results of the survey of firms in the industry and incorporates the interview findings with industry experts. These chapters cover:

---

1 Manpower and Employment Implications of New Technologies in Selected Industries in Ontario to 1995. The terms of reference of this assignment can be found in Appendix 3 to the Task Force's final report.

2 1970, Standard Industrial Classification (SIC), Statistics Canada.

- a review of recent and anticipated technology adoptions,

- the outlook for the industry to 1995, including expected output and employment levels,

- effects on employment of new technology such as anticipated occupational shifts and changes in required skills,

- a review of the labour relations environment as it relates to new technology, and

- observations on planning efforts for technological change in the industry.

- Part four of the report includes various appendices that support the text of individual chapters.

1.2 Study Approach

The study approach selected incorporates the following research techniques:

- analysis of published statistics and reports on the industry, augmented by the working knowledge of industry specialists within Currie, Coopers & Lybrand,

- in-depth interviews with management and labour experts in the industry, conducted at various stages in the project, using structured interview guides, and

- an industry survey.

The reasons for the choice of these techniques are explained below.

1.2.1 Historical Analysis

The purpose of the historical analysis was to provide an informed perspective on the industry from which to view future trends. The historical analysis covers: the economic environment, competitive factors, output and employment patterns, productivity, technology adoption and the industrial relations environment. In order to permit cross industry analysis, consistent indicators and data sources were used.

1.2.2 Expert Interviews

At various stages in the project, a series of in-depth interviews were conducted with industry leaders, industry associations and union representatives. These experts have a broad understanding of the industry in terms of both its historical development and its future outlook. Their input assisted in the preparation of the historical analysis and in the survey design, and facilitated a clearer interpretation of the survey results.

1.2.3 Sample Survey of Firms

The following describes the key features of the survey.

Ontario firms in the Telecommunications Industry were identified.[1] All firms with twenty or more employees were included in the sample frames. Two surveys were conducted, one for Telephone Systems and the other for Telegraph and Cable Systems. Employment in the sample frame firms is estimated to represent 99 percent of the 30,423 Ontario employees in the Telephone Systems

---

1 The source for telephone systems was the Ontario Telephone Service Commission, 1983 Annual Report. A telephone survey identified companies with 20 or more employees in Ontario. The source for telephone interconnect firms and employment was the Canadian Interconnect Directory, Northern Business Information Limited, 1984.

Industry. The sample frame for the Telecommunications Industry included all four telecommunications carriers in Ontario.[1] These firms represent 100 percent of the 2,543 Ontario employees in this industry.

A representative, random sample of firms[2], stratified by employment size categories (see Appendix A), was chosen from each sample frame. The senior executive officer of each firm was identified and a structured questionnaire was sent to this individual.

A search was carried out of the Ontario Ministry of Labour Collective Agreements Library to identify unions in the sample firms. Union head offices were contacted to identify the appropriate union leader in each of the unionized firms in the sample. The same questionnaire was sent to union representatives. A copy of the survey questionnaire is attached as Appendix B, together with an outline of the number of responses by question.

Consultants provided ongoing assistance to respondents, both on the telephone and in person, to complete the questionnaires. The questionnaire survey process generally ended with a personal interview. The number of firms and unions who participated in the sample survey are shown in Table 1.

---

1 The source for these firms is Telecommunications Statistics, Catalogue No. 56-201. Employment was established through a telephone survey.

2 The number of firms should not be confused with the number of establishments. Establishments are production centres. Therefore, a firm may have more than one establishment.

TABLE 1

NUMBER OF FIRMS AND UNIONS RESPONDING BY FIRM EMPLOYMENT SIZE

Firms by Employment Size	TELEPHONE SYSTEMS 544			TELECOMMUNICATIONS 545		
	Firms	Unions(2)	Firms in Sample Frame(1)	Firms	Unions(2)	Firms in Sample Frame (1)
Small 20-199	6		30	1		2
Medium 200-999	1		6	1		1
Large 1,000 +	1		1	1		1
TOTAL	8	1	37	3	1	4

(1) Source: See footnotes, pages 3 and 4.
(2) The union questionnaire applies to workers in more than one firm size group.

In most cases, several participants in each organization contributed to the completion of a questionnaire. In the Telephone Systems survey, an average of 1.1 participants contributed to a firm questionnaire and 4.0 participants to a union questionnaire. The companies' principal participants had an average of 9.1 years' experience with their firms and 15.6 years in the industry. The union's principal participant had 44 years experience with the industry. In the Telegraph and Cable Systems survey, an average of 3.0 participants contributed to a firm questionnaire and 1.0 participants to a union questionnaire. The companies' principal participants had an average of 17.7 years' experience with their firms and 25.3 years in the industry. The union's principal participant had 37.0 years' experience with the industry.

The sample survey results have been weighted up to the number of firms in the sample frame. That is, the survey results reported herein refer to the weighted survey results and are, therefore, representative of firms with twenty or more employees in the Telecommunications Industry in Ontario.

The reliability for the sample for the Telephone Systems Industry is estimated at 90 percent, with a 23 percent allowable error and 90 percent with a 20 percent allowable error for the Telegraph and Cable Systems Industry. See Appendix C for an explanation of the sample reliability calculation method.

Readers should be cautioned about the nature and reliability of the sample survey results. The questionnaire included a set of questions asking respondents about the future (i.e., five and ten years ahead) from a particular point in time. The results are, therefore, a representative sample of views about, and expectations for, the future and should not be viewed as what will necessarily take place. The survey provides a useful perspective from which to better understand how the industry perceives the future of new technology adoption and its anticipated impacts on employment.

The following chapters of the report discuss the historical analysis and review the results of the sample survey and expert consultation which discuss the anticipated trends for the period 1985 to 1995.

The report is divided into two sections as follows:

Section I - Telephone Systems

Section II - Telegraph and Cable Systems

SECTION I - TELEPHONE SYSTEMS

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

This section of the report provides an historical analysis of trends in the Telephone Systems Industry for the period 1971 to 1981 and 1982 to 1984.

The Telephone Systems Industry includes establishments primarily engaged in providing telephone service, telephone instruments for rent or purchase and a variety of other services such as data communications, mobile telephones and radio-paging. These establishments also provide maintenance services and operate schools for training operators.

Table D.1 indicates that in 1982, $2.3 billion of a total of $4.7 billion (or 50 per cent) of operating revenues of telephone companies in Ontario and Quebec were from toll service revenues, and message toll revenues in particular. (The historical tables are presented in Appendix D in Part IV of the report.) Local service revenues accounted for another $2.2 billion (or 46 percent) in 1982. Charges to customers - which includes revenues for monthly service and equipment, for message charges and for non-recurring charges - was the major component of local service revenues.

Other sources of revenue for telephone companies include directory advertising and sales, plant and building rental and other miscellaneous operating revenues. Together these items accounted for under 5 percent of operating revenues in 1982.

2.1 The Market Environment

This section describes successively the companies active in this field, the regulatory framework, the impetus provided by

technological innovation, and the resulting challenges for the telephone companies.

2.1.1 The Principal Carrier: Bell Canada

The main telephone company in Ontario is Bell Canada, with over 95 percent of the access lines. Other operations include Ontario Northland Communications, and municipal systems in 16 cities (principally Thunder Bay, Kenora, Dryden, Cochrane and Ripley). The following description focusses on Bell Canada's operations.

Bell Canada ("the company" or "Bell") is a wholly-owned subsidiary of Bell Canada Enterprises, whose shares are quoted on stock exchanges. Through its parent company, Bell Canada is related to a telephone equipment manufacturer (Northern Telecom), to the largest privately-owned Canadian R&D organization (Bell-Northern Research) and to a host of other companies active in printing, real estate and gas transmission.

The company provides local and intercity telephone service in Ontario and Quebec. The regional operations for Ontario are headquartered in Toronto. Bell is the major supplier of telephone instruments for rent or purchase; it provides a wide range of other services including mobile telephone, radio-paging, data communications, and soon, cellular radio. Within all this, the main activity is the provision of voice telephony supplemented by data and video services.

In cooperation with other large telephone companies, Bell Canada is a member of Telecom Canada (formerly known as the Trans-Canada Telephone System). The members of Telecom Canada provide interprovincial telephone services and cooperate on other services: data communications

(transmission and consulting), marketing efforts to large customers, and others. Bell Canada also owns a share of Telesat Canada, the domestic supplier of satellite communication services; Bell interconnects with Teleglobe for communications to countries other than the United States. (Both Telesat and Teleglobe are key members of SIC 545.)

2.1.2 Lighter Regulation and New Entrants

Bell Canada is a monopoly regulated by the Canadian Radio-television and Telecommunications Commission ("CRTC"), a federal agency. Broadly speaking, the CRTC sets rates and tariffs, reviews construction programs, and takes action in other areas as required.

In the 1970's, the telephone monopolies were challenged in the United States, the United Kingdom and Canada. Following the example set in the United States, the CRTC allowed effective competition in selected segments of the market. Interconnection of terminal equipment was approved permanently in November 1982, with some technical specifications and a registration program. The tariffs were revised in the summer of 1984, allowing for unbundled rates between access lines and sets, and for installation charges for jacks. Many new competitors are now battling it out in the marketplace, including Canadian Telecommunications Group and Telecommunications Terminal Systems.

Competition for certain intercity services was allowed in 1981. A joint venture, CNCP Telecommunications, offers certain services including private lines, data transmission and a packet-switched network. Two parallel cellular radio networks were authorized in March 1984: one for the established telcos (telephone companies), and

one for a new company, Cantel. The CRTC also allowed transborder data transmission by certain United States' satellite companies (SBS and American Satellite): this opened the way to bypassing the local loop monopoly (local loops are the pathways [cable] that transmit voice, data or video messages from terminals to local switching offices). In July 1984, the CRTC announced a new "light-handed regulatory approach" to enhanced services. These services include, for example, voice messaging, data base retrieval and electronic mail. In effect, the new companies would be unregulated, resale of services would be required and regulatory safeguards would be maintained against telcos.

In November 1984, the CRTC started new hearings on competition in public toll service. The decision will have tremendous impact on Bell Canada, in terms of rate balancing between local and long-distance service, needed improvements in operating efficiencies and overall organization.

2.1.3 Technological Innovation

As with other technology-based industries, innovation plays a major role in reshaping the telecommunications arena. Such innovations bring new features, functions and benefits to telecommunications products and services. Innovations also redefine the boundaries between telecommunications and other industries, prodding firms to modify the range of their activities. Five examples are given below.

Communications satellites have drastically increased their capacity and lowered unit transmission costs through the use of higher frequencies, increased power and smaller antennas. As a result, long distance transmission costs

are now not only lower, but also insensitive to distance. Also, since anyone can easily and cheaply own a ground antenna, opportunities have arisen for large users to bypass the monopolistic local loop.

Optic fibers are thin strands of pure glass used for ground transmission. These fibers offer more bandwidth and greater channel capacity. Again, this technology offers potentially lower unit costs. Fiber optics could eventually accommodate both the telecommunications and the broadcasting industries, in providing customers with access to new information and entertainment services.

Cellular radio is a refinement of the traditional mobile telephone service. This new technology will make for a better allocation of channels in dense metropolitan areas, and higher quality of service. More users should be able to afford the service, as unit prices fall with increased volume.

Added features are becoming available on various products and services, enabling users to access, process and disseminate information more quickly, efficiently and effectively. These features were made possible by the increased use of electronics in terminals, private branch exchanges, and central office switches. Examples of such features include speed dialing, call forwarding, voice messaging and teleconferencing.

Intelligent building wiring is progressively being introduced. With the help of local area networks and special-purpose microcomputers, new possibilities emerge for increased efficiencies. For example, various pieces of office equipment (word processors, copiers, computer terminals) can communicate with one another; tenants in

larger office buildings can now share some services, such as rooftop satellite antennas; and integrated management and control of energy and security is now possible.

Most of these innovations have encountered strong market demand. Partly because of still unfulfilled needs, market growth is projected to continue just as strongly in the future, prompting the interest of many companies to enter the telecommunications business.

2.1.4 Challenges for Telcos

Prior to the past decade, the telecommunications services industry was believed to be best run as a regulated monopoly. The rationale for this industry structure was commonly accepted by nearly all industry participants and observers. This rationale was based on the following premises and objectives:

- economic efficiency to provide good quality of service at low price to users;
- protection of low income groups, rural areas and residential customers, through cross-subsidies;
- presence of 'economies of scale' in long distance services and 'natural monopoly' in the local loops; and
- protection of network integrity and compatibility.

The above premises have been challenged by perceived new market needs and opportunities including principally:

- technological innovations in products and services;

- technological migration between related industries: telephony, telecommunications, data processing, office automation, broadcasting and others; and

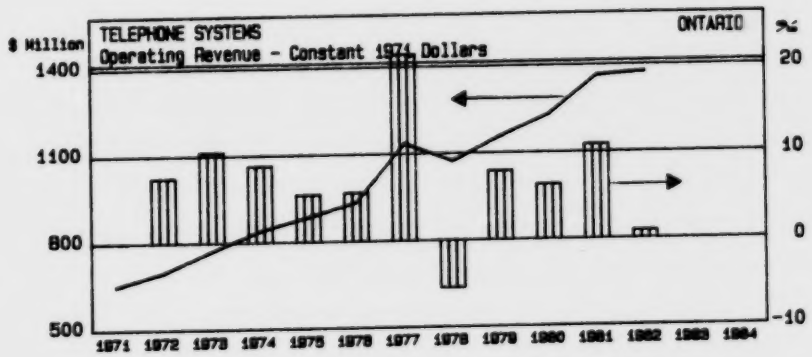
- internationalization of needs, services and products.

Whereas the old premises led naturally to a regulated regional monopoly, now the new needs and opportunities dictate an evolution towards normal market competition. This evolution creates a major upheaval for established telephone companies.

2.2 Industry Trends

2.2.1 Aggregate Output

EXHIBIT 1



Operating revenue for Telephone Systems in Ontario was not available, as Bell Canada (the largest operator in Ontario) reports all of its revenue in Quebec. In order to estimate the Ontario portion, a ratio was applied based on the number of telephones in Ontario as a percentage of the total number of telephones in Ontario and Quebec. This ratio was then applied to the combined operating revenues in Ontario and Quebec to determine the revenues accruing to Ontario (see Tables D.2 to D.5).

In current dollars, operating revenues in Ontario went from $648.8 million in 1971, to $2,488.9 million in 1981. In 1982, contrary to trends experienced in most other industries, operating revenues increased by 13.0 percent to $2,811.5 million.

In constant 1971 dollars, operating revenues increased from the 1971 level of $648.8 million to $1,361.5 million in 1981, experiencing an average annual growth rate of 7.7 percent.

Operating revenues showed a negative change only once in the time period in question, dropping 5.5 percent between 1977 and 1978. Telephone systems proved fairly resilient to the 1981-1982 economic downturn, with operating revenues increasing 10.9 percent in 1981, and less than one percent in 1982.

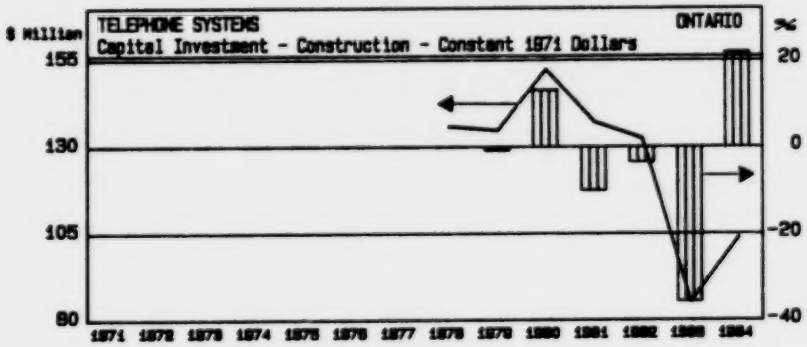
2.2.2 Capital Investment

Capital investment data for SIC 544 (Telephone Systems) and SIC 545 (Telecommunications Carriers, i.e., Telegraph and Cable Systems) are combined, and is only available for the years 1978 to 1984.

Total capital investment by Telephone Systems and Telecommunications Carriers in Ontario increased from $639.1 million in 1978 to $958.5 in 1982. It dropped slightly in 1983 to $838.4 million but was expected to recover to $901.9 million in 1984.

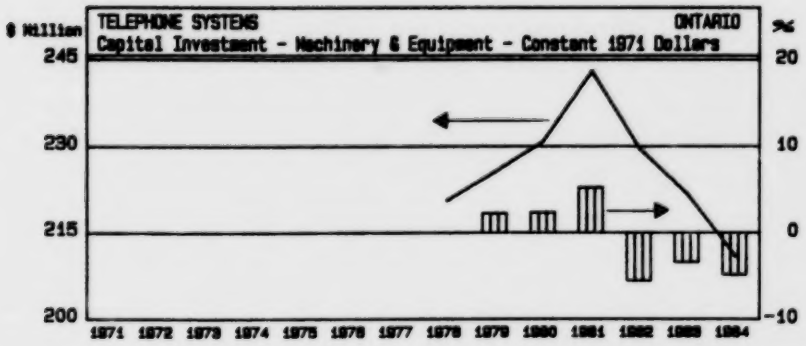
In constant 1971 dollars, total capital investment was at the $356.1 million level in 1978, increasing to $361.5 by 1982. This was followed by a drop of 15.2 percent in 1983 to the $306.5 million level, with an increase of 2.5 percent expected in 1984.

EXHIBIT 2



Annual capital investment on construction has been less consistent than machinery and equipment investment by the telephone and telecommunication industries. Between 1978 and 1982, construction expenditure ranged between $132 and $137 million, peaking at $152.1 million in 1980 and bottoming out in 1982 at $132.1 million. Construction spending dropped almost 36 percent to a low of $85.0 million in 1983. This figure was expected to improve to $103.6 million in 1984, an increase of 21.9 percent.

EXHIBIT 3



Capital expenditure on machinery and equipment stayed fairly constant throughout the period. In 1978 machinery and equipment expenditure was $220.5 million. It peaked in 1981 at $242.9 million and was followed by three successive declines of 5.6, 3.4 and 4.9 percent respectively, resulting in a low for the period of $210.7 million in 1984.

2.2.3 Employment

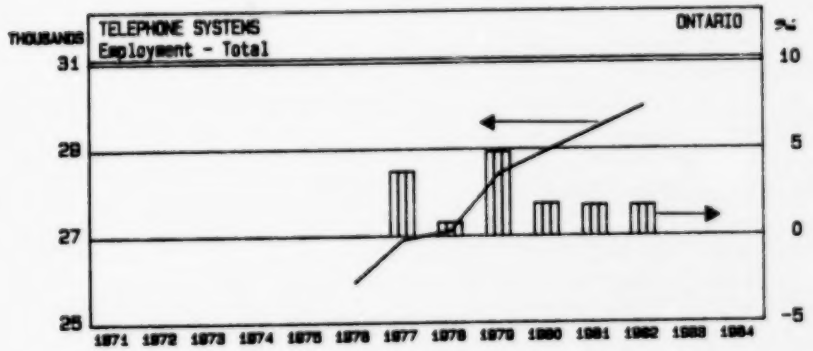
The discussion of employment includes an analysis of aggregate trends and occupational changes.

- Aggregate Trends

  In this report two sources of employment data are used in order to provide the level of analysis required. Total employment trends for Ontario are estimated using the total number of Bell employees as being representative of 95 percent of total employment for the province. This ratio is based on Bell's share of activity within Ontario. This data

series is used as it shows the year to year trend in employment. In order to analyze the employment trends by occupation, the Census of Canada has been used. However, this data is only available for the census years 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

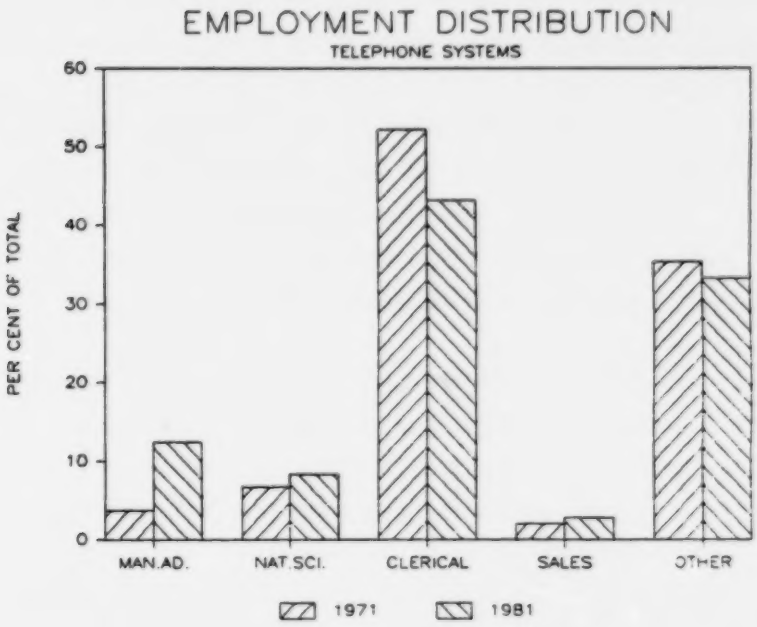
EXHIBIT 4



Between the years 1976 and 1982, employment has risen consistently from 25,928 in 1976 to 29,960 in 1982, an average annual increase of 2.4 percent (see Tables D.2 and D.3). The largest increase came about in 1979 (4.8 percent) while the smallest increase, 0.8 percent, was experienced a year earlier in 1978.

- **Occupational Changes**

EXHIBIT 5



According to the census data for Ontario there were 37,920 employees in the Telephone Systems Industry. The employment in this industry experienced a growth rate of 4.9 percent between 1971 and 1981, as seen in Table D.6.

At the broad occupational level, the largest group by far was Clerical and Related with over 43 percent of total employment (16,370 employees). This was the only group to experience an average annual growth rate, (3.0 percent), less than the average for the industry.

The highest average annual growth rate was 18.2 percent experienced by Managerial, Administrative and Related workers. They were the second largest broad occupational group with 4,690 employees in 1981.

Natural Sciences, Engineering and Mathematics accounted for 8.3 percent of total employment and had an average annual growth rate of 7.2 percent. The smallest group was Sales, with only 1,075 employees and an average annual growth rate of 8.9 percent.

At the more detailed occupational level, within Clerical and Related occupations, the largest category in 1981, telephone operators (3,745 employees) experienced a declining average annual rate of change of 1.4 percent.

General office clerks and other clerical and related, n.e.c. accounted for over 25 percent of employment in this group (1,670 and 2,490 employees respectively) and both categories had the same average annual growth rates of 3.4 percent. The highest average annual growth rate was 10.3 percent for bookkeepers and accounting clerks, which accounted for 11.5 percent of employees in this group.

The overall highest average annual growth rate of 31.1 percent was experienced by management, transport and communications operations. There were 1,500 employees in this category in 1981.

Women accounted for 50.4 percent of total employment in 1981, or 19,110 employees. The proportion decreased slightly from 1971 when it was 51.8 percent. There was still a net increase of 6,975 new jobs for women over the time period.

Over three-quarters of all women were employed in Clerical and Related occupations in 1981. (Table D.7). At that time they constituted 89.2 percent of employment in that group, a slight drop from 1971 (90.3 percent).

The next largest occupational group for women was Managerial, Administrative and Related, with 1,700 female employees in 1981. They increased their share of employment in this group from 23.3 percent in 1981 to 36.2 percent in 1981, an increase of 1,495 new jobs over the decade.

Natural Sciences, Engineering and Mathematics accounted for 700 female employees in 1981. Women increased their proportion of employment from 6.1 percent in 1981 to 22.3 percent in 1981.

The smallest employment group for women was Sales, with only 590 jobs in 1981. Women accounted for over half the employment in this field in 1981 compared to less than one-third in 1971.

Results of Question 3

TABLE 2: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Percent of Firms Planning to Adopt New Technologies by Employment Size (1)

Technologies	Before 1985 Total	1985-1990 Total	1990-1995 Total
CUSTOMER AND SERVICE DELIVERY TECHNOLOGIES			
Computer Service Order Processing	33	52	-
Computer Client Accounts	65	35	-
Automated Diagnostics	65	20	16
Customized Telecommunication Systems	49	1	-
Voice Synthesis Applications	0	17	48
Voice Recognition Applications	0	33	33
DESIGN TECHNOLOGIES			
Computer-Aided Design (CAD)	33	1	-
Computer-Aided Engineering (CAE)	16	17	-
OFFICE AUTOMATION TECHNOLOGIES (Own Operations)			
Word Processing	84	16	-
Electronic Filing	49	33	-
Internal Data Base Management Systems	49	33	-
Local Area Networks (LANs)	16	49	-
Computerized Decision Support Systems	33	33	-
Voice Activated Computers	0	17	49
Artificial Intelligence/Expert Systems	16	16	33
Integrated Work Stations	1	36	33
Other	0	1	-
TELECOMMUNICATIONS TECHNOLOGIES (Own Operations)			
Private Automatic Branch Exchange (PABX)	65	20	-
Electronic Mail	68	1	-
Voice Mail	0	52	1
Facsimile with Built-In Microprocessor (FAX)	1	16	16
Satellite/Microwave Systems	1	1	16
Videotex	0	1	33
Video Conferencing	1	16	19
Fibre Optics	1	20	32
Other	0	-	16
OTHER TECHNOLOGIES			
4th Generation Computer Languages	17	49	-
Others	0	1	-

(1) '0' used prior to 1985 to indicate have not adopted. '-' used for period 1985-1990 and 1990-1995 to indicate respondents, at the time of survey, are not planning to adopt this technology or 'don't know'. Responses are not mutually exclusive.

PART III - FUTURE TRENDS: THE SURVEY RESULTS

Part III of this study presents the survey results which discuss the firms' surveyed opinions as to future trends in technology adoption and employment impacts.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Telephone Systems Industry and the factors driving the need for and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

As noted in the historical chapter, there is a great deal of new technology in use or coming into use in telephone operations. The focus in this chapter shifts away from new technology used in the communications process toward new technology used in firms' internal operations. The industry has been active here too in pursuing the adoption of new technology in many different areas. Table 2 outlines firms' acquisitions of new technologies to date and their plans to 1995.

3.1.1 Customer and Service Delivery Technologies

The industry has adopted several new technologies in this area. Computers are in use to aid in processing service orders by 33 percent of firms. Automated diagnostic systems for communications facilities and customized telecommunications systems are also in widespread use. The industry plans to continue investing in such facilities in future as well as into voice synthesis and recognition applications.

3.1.2 Design Technologies

The industry has already introduced computers to assist in design work and plans to continue to do so in the years to 1990. Firms will also extend their purchases for engineering applications.

3.1.3 Office Automation Technologies

The industry has adopted in varying degrees all the available technologies listed in the survey except voice activated computers. Those with the highest penetration rates are word processing, electronic filing and internal data base management systems. Purchases of filing and data base management systems are planned up to 1990. Other areas will also see investment expenditures. These include local area networks (LANS), computerized decision support and integrated work stations. Firms also plan steady purchases to 1995 of artificial intelligence systems and voice activated computers. Other technologies under consideration by the industry include text messaging and pattern recognition systems.

3.1.4 Telecommunications Technologies

Most firms are already using private automatic branch exchanges and electronic mail in their facilities. Other technologies have been introduced but in many cases will not be in use in most firms until after 1990. These include facsimile and satellite communications systems, videotex and video conferencing. The 1985 to 1990 period should see progress in adopting voice mail systems and fibre optics.

3.1.5 Other Technologies

Mention should be made of the industry's interest in fourth generation computer languages, which are already in use and will be introduced by several firms in the 1985 to 1990 period. Another technology under consideration for future adoption is optical storage.

3.2 Forces Driving the Need to Adopt New Technology

The two most important forces inducing the industry to adopt new technology are:

- the need to increase quality, and
- the need to increase the firm's capabilities and skills.

An important element for some firms in improving the firm's capabilities is strengthening the ability to process information both for themselves and as a service to customers.

Secondary considerations shared by several firms include such factors as the need to lower costs, the rapid growth of the industry (or at least industry opportunities) and the pending obsolescence of existing technology embodied in much of the present equipment and facilities. Table 3 contains respondents' views.

3.3 Forces that Could Slow the Rate of Technology Adoption

Firms cite the following factors more frequently than any others as forces that could retard the spread of new technology:

- the cost of new technology,
- the ability to finance purchases of equipment embodying new technology, and
- the effect of poor economic conditions.

An important secondary concern is lack of uniform standards which make it difficult to purchase different firms' products and then connect them. Another retarding influence being experienced is difficulty in acquiring staff capable of taking advantage of the benefits offered by new technology. Respondents' views are summarized in Table 4.

TABLE 3: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Results of Question 4

Most Important Factors Driving Need To Adopt New Technologies

Factor		Percent of Firms by Employment Size: Total Firms
COMPETITIVE PRESSURES	First	1
	Second	16
	Third	16
	Weighted Importance (1)	0.5
CUSTOMER DEMANDS FOR CHANGES	First	16
	Second	0
	Third	0
	Weighted Importance	0.5
INCREASE PROFITABLITIY	First	0
	Second	1
	Third	0
	Weighted Importance	0.0
INCREASE PRODUCTIVITY	First	0
	Second	0
	Third	16
	Weighted Importance	0.2
INCREASE QUALITY	First	32
	Second	16
	Third	1
	Weighted Importance	1.3
INCREASE MANAGEMENT INFORMATION	First	16
	Second	3
	Third	0
	Weighted Importance	0.6
LOWER COSTS	First	0
	Second	16
	Third	16
	Weighted Importance	0.5
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	19
	Second	16
	Third	16
	Weighted Importance	1.1
ENTER NEW MARKETS/ GROWTH	First	16
	Second	0
	Third	0
	Weighted Importance	0.5
OBSOLESCENCE	First	0
	Second	16
	Third	16
	Weighted Importance	0.5
ALL OTHERS	First	0
	Second	16
	Third	0
	Weighted Importance	0.3

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 5

TABLE 4: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size: Total Firms
ABILITY TO FINANCE	First	33
	Second	0
	Third	0
	Weighted Importance (1)	1.0
COST OF NEW TECHNOLOGY	First	32
	Second	35
	Third	0
	Weighted Importance	1.7
POOR ECONOMIC CONDITIONS	First	32
	Second	0
	Third	0
	Weighted Importance	1.0
LACK OF SKILLS AND/OR KNOW-HOW TO IMPLEMENT	First	0
	Second	32
	Third	1
	Weighted Importance	0.6
LACK OF NEW TECHNOLOGY STANDARDIZATION	First	0
	Second	1
	Third	48
	Weighted Importance	0.5
UNWILLINGNESS TO CHANGE	First	3
	Second	0
	Third	0
	Weighted Importance	0.1
ALL OTHERS	First	0
	Second	0
	Third	16
	Weighted Importance	0.2

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

4.0 INDUSTRY OUTLOOK TO 1995

This chapter reviews the anticipated outlook for the industry in terms of aggregate output (i.e., operating revenues in Ontario) investment plans, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

The industry expects strong growth in constant dollar operating revenues of about 11 percent in 1985. This continues the strong growth trends of the 1970's noted in the historical section of the report. The years to 1995 should see a slight moderation in growth to 1990 followed by a small pick-up in 1990-1995. Table 5 reports the industry's views.

4.2 Investment Patterns

The industry plans to devote a high proportion of future investment to machinery and equipment, 90 percent to 1990 and increasing in the period to 1995. The new technology component of this type of investment is likely to be about 65 percent. In contrast, the new technology component of construction investment will be 12 percent.

4.2.1 Justifying Financial Investment in New Technology

As with other investment, new technology investment is subjected to formal tests of profitability. The industry appears to require a return on investment of about 19 percent. However, the ROI in review is used by just 20 percent of firms and in some cases the average rate depends on market conditions. Those who use a pay-back criteria look for investment to pay for itself within five years. Survey results are presented in Table 6.

Results of Question 1

TABLE 5: TELEPHONE SYSTEMS AND INTERCONNECTS

SIC 544

Operating Revenues in Ontario

Average Annual Compound Rate of Change (in Constant Dollars) (1)

Firms by Employment Size	Estimated			Expected	
	1982-1983	1983-1984	1984-1985	1985-1990	1990-1995
Total Firms	8.0	7.5	11.0	8.0	9.0

(1) Rounded to closest 0.5 %

4.2.2 Source of New Capital Spending

The industry expects to finance 80 percent of its anticipated investment programs from internal funds and 20 percent from external funds. (Table 7).

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate industry employment in Ontario.

4.3.1 Factors Affecting Employment

Respondents see two influences of prime importance in determining employment levels. These are:

- the introduction of new technology, and
- industry-wide growth.

Some firms see new technology having a contracting effect on employment but others see technological change as a source of opportunity to build new markets and increase employment levels. Secondary considerations include the overall growth in the economy and the competitiveness of firms. Table 8 presents the views of respondents.

4.3.2 Employment Outlook

The industry's employment level is expected to continue to decline in 1985. The years from 1985 to 1995 should see almost no change in employment in the industry (see Table 9). Comparing the employment outlook with constant dollar operating revenue forecasts indicates that firms expect a substantial increase in labour productivity over the next ten years.

Results of Question 17e

TABLE 6: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Justifying Financial Investment in New Technology

Firms by Employment Size	Pay-Back Period: % of Firms Using Pay-Back	Pay-Back Period: Average Period (Years)	Return on Investment: % of Firms Using ROI	Return on Investment: Average Rate (%)
Total Firms	1	5	20	19

Answers not mutually exclusive.

Results of Question 17f

TABLE 7: TELEPHONE SYSTEMS AND INTERCONNECTS

Source of Funds for New Technology Spending

Employment Size	Internal Funds (Percent)	External Funds (Percent)
Total Firms	80	20

Results of Question 11a,b,c

TABLE 8: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Most Important Factors Affecting The Firms' Employment in Ontario

Percent of Firms by Employment Size

Factor		Total Firms
PROFITABILITY/ FINANCIAL STRENGTH	First	0
	Second	16
	Third	0
	Weighted Importance (1)	0.3
INTRODUCTION OF NEW TECHNOLOGY	First	19
	Second	48
	Third	16
	Weighted Importance	1.7
PRODUCT DIVERSIFICATION	First	0
	Second	0
	Third	16
	Weighted Importance	0.2
AVAILABILITY OF NECESSARY SKILLS	First	0
	Second	0
	Third	16
	Weighted Importance	0.2
ABILITY TO COMPETE	First	17
	Second	0
	Third	0
	Weighted Importance	0.5
INDUSTRY-WIDE GROWTH	First	32
	Second	16
	Third	0
	Weighted Importance	1.3
OVERALL ECONOMIC GROWTH	First	32
	Second	0
	Third	16
	Weighted Importance	1.1
ALL OTHERS	First	0
	Second	5
	Third	19
	Weighted Importance	0.3

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 11d

TABLE 9: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Firms' Employment Trends in Ontario

Firms by Employment Size	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated Rate		Expected Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Total Firms	-2.0	-3.0	0.0	-0.5

(1) Rounded to closest 0.5%.

4.3.3 Trends in Part-Time Work

Firms did not provide sufficient information to form an industry estimate of present levels or future trends.

4.4 Changes in Occupational Structure

Table 10 reports anticipated trends in firms' occupational structure to 1995. Increased occupational shares are expected in the following groups:

- Managerial, Administrative and Related,
- Natural Sciences, Engineering and Mathematics, and
- Sales.

Significant declines in shares are expected in Clerical and Other Occupations. Clerical positions will still be the most numerous by 1995.

Much of the shift in occupational shares derives from different rates of growth among firms with significantly different occupational structures. However, some individual occupations stand out for their changing importance. For example, systems analysts, electrical engineers and engineering technicians are expected to lead the increase in the share of the Natural Science group of occupations. Similarly, the declines in the share of Clerical workers is projected to be concentrated in receptionists and telephone operators.

Results of Question 12

TABLE 10: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	2.5	2.8	3.5	3.6	3.7
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	6.3	7.8	8.1	8.9	9.3
• Electricial Engineers		+	+	+	0
• All Other Engineers		+	0	+	0
• Engineering Technicians and Technologists		+	0	+	+
• Draughtsmen		0	0	0	0
• Systems Analysts and Computer Programmers		+	+	+	+
• All Other Natural Sciences, Engineering and Mathematics		+	0	+	0
CLERICAL					
• Clerical Supervisors	53.5	52.9	52.7	51.9	51.7
• Secretaries		-	+	0	0
• Typists/Clerk Typists (includes Word Processing Operators)		0	0	0	0
• Bookkeepers and Accounting Clerks		0	0	+	0
• EDP Equipment Operators		0	0	0	-
• General Office Clerks		-	0	0	0
• Telephone Operators		-	-	0	0
• Receptionists and Information Clerks		-	-	-	-
• All Other Clerks		+	0	-	0
SALES	1.5	2.3	2.5	3.7	3.9
OTHER OCCUPATIONS	36.3	34.2	33.3	32.0	31.5
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease 0 no change

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results on the employment effects of new technology in terms of skills match and requirements and impact on skill levels and job content.

5.1 Effect on Occupations

Respondents indicated that, for many occupations, the majority either feel that there will be a balance between their needs and skill availability or have no response. Firms expect a shortage of skilled employees arising from changing technology in Sales positions and among systems analysts. A shortage may occur for engineering technicians.

On balance, respondents are cautiously predicting an oversupply of receptionists. Some respondents expect oversupply in several Clerical occupations but their views are outweighed by those expecting balance in supply and demand. Respondents' views are recorded in Table 11.

5.2 Likely Steps to Deal Work With Skills Oversupply

Respondents mention lateral transfer and retraining as the most important means of adjusting to an oversupply of skills. Attrition is mentioned as an approach to be used in some cases listed by a small minority of firms. These views are summarized in Table 12.

5.3 Likely Steps to Deal with Skills Shortages

Recruiting is the primary means likely to be used in eliminating or reducing a shortage of skills in most occupations. For those occupations judged most likely to produce a shortage, upgrading of employees to higher skill levels than previously is a strong second choice. A summary of respondents' views is presented in Table 13.

Results of Question 6

TABLE 11: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Impact of Technology on Selected Occupations in Firms 1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	1	4	95
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Electrical Engineers	0	4	96
• All Other Engineers	0	3	97
• Engineering Technicians and Technologists	16	36	48
• Draughtsmen	0	3	97
• Systems Analysts and Computer Programmers	0	52	48
CLERICAL			
• Clerical Supervisors	4	0	96
• Secretaries	4	16	80
• Typists/Clerk Typists (includes Word Processing Operators)	3	1	96
• Bookkeepers and Accounting Clerks	0	3	97
• EDP Equipment Operators	0	16	84
• General Office Clerks	4	0	96
• Telephone Operators	4	0	96
• Receptionists and Information Clerks	19	0	81
SALES	0	58	42
OTHER OCCUPATIONS	17	0	83

Results of Question 7

TABLE 12: TELEPHONE SYSTEMS AND INTERCONNECTS SIC 544

Steps Firms Will Likely Take to Deal With an OVERSUPPLY of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	n.a.	n.a.	n.a.
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineering Technicians and Technologists	Attrition	(1)	(1)
CLERICAL			
• Clerical Supervisors	Attrition	(1)	(1)
• Secretaries	Lateral Transfer	(1)	(1)
• Typists/Clerk Typists (includes Word Processing Operators)	Lateral Transfer	(1)	(1)
• General Office Clerks	Retrain	(1)	(1)
• Telephone Operators	Lateral Transfer	(1)	(1)
• Receptionists and Information Clerks	Lateral Transfer	Retrain	(2)
OTHER OCCUPATIONS	Layoff	Retrain	(2)

(1) Only one step mentioned.
(2) only two steps mentioned.
n.a. no answer.

Results of Question 8

TABLE 13: TELEPHONE SYSTEMS AND INTERCONNECTS

Steps Firms Will Likely Take to Deal With SHORTAGE of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Retrain	(1)	(1)
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Electricial Engineers	Recruit	(1)	(1)
• All Other Engineers	Recruit	(1)	(1)
• Engineering Technicians and Technologists	Recruit	Retrain	Upgrade
• Draughtsmen	Retrain	(1)	(1)
• Systems Analysts and Computer Programmers	Recruit	Upgrade	Retrain
CLERICAL			
• Secretaries	Upgrade	(1)	(1)
• Typists/Clerk Typists (includes Word Processing Operators)	n.a.	n.a.	n.a.
• Bookkeepers and Accounting Clerks	Recruit	Upgrade	(2)
• EDP Equipment Operators	Retrain	Upgrade	(2)

(1) Only one step mentioned.
(2) Only two steps mentioned.
n.a. no answer.

5.4 New Technology Impact on Skill Levels and Job Content

Respondents were asked to judge the expected impact of new technology on occupations in terms of:

- skills required,
- time required to achieve proficiency, and
- knowledge of their firms' operations.

The industry believes skill requirements will increase regardless of occupation as new technology is introduced into the workplace. The exceptions to this view are draughtsmen, whose skills are expected to remain unchanged, and bookkeepers, whose skill levels may decline according to respondents.

Firms are less certain about the impact of new technology on time to become proficient than on skill requirements. Bookkeepers, secretaries and receptionists are expected to need less time to learn their tasks than previously. Several occupations, including engineering technicians, systems analysts, clerical supervisors, telephone operators, salespersons and EDP equipment operators are candidates to see time requirements increase. Other occupations should experience no change in time required to become proficient.

Respondents see knowledge requirements increasing along with skills requirement although they are sometimes more cautious in their views than in the case for skill levels. Again, bookkeepers are seen as good candidates for declining requirements. Table 14 records respondents' views.

5.5 Training Costs and New Technology

The industry is estimated to devote approximately 13.5 percent of total labour costs to employee training. This level is expected to return to traditional levels by declining to 9.0 percent by

Results of Question 9

TABLE 14: TELEPHONE SYSTEMS AND INTERCONNECTS — SIC 544

Impact of Technology on Skill Levels and Job Content

(1) Percent of Firms

Occupations	Skills Required			Time to Achieve Proficiency			Knowledge of Firm's Operations		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	100	0	0	61	38	1	81	0	19
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Electricial Engineers	100	0	0	0	0	100	100	0	0
• All Other Engineers	100	0	0	0	0	100	100	0	0
• Engineering Technicians and Technologists	84	16	0	67	32	1	36	0	64
• Draughtsmen	0	0	100	0	0	100	100	0	0
• Systems Analysts and Computer Programmers	100	0	0	100	0	0	100	0	0
CLERICAL									
• Clerical Supervisors	100	0	0	62	31	7	68	0	32
• Secretaries	69	31	0	31	62	7	68	0	32
• Typists/Clerk Typists (includes Word Processing Operators)	76	24	0	47	47	5	76	0	24
• Bookkeepers and Accounting Clerks	38	62	0	0	62	38	6	31	63
• EDP Equipment Operators	100	0	0	100	0	0	100	0	0
• General Office Clerks	31	0	69	31	0	69	6	0	94
• Telephone Operators	61	0	39	61	0	39	31	0	69
• Receptionists and Information Clerks	48	0	52	24	48	29	29	0	71
SALES	81	0	19	80	19	1	81	0	19
OTHER OCCUPATIONS	0	0	100	0	0	100	0	0	100

+ increase - decrease 0 remain the same

(1) Non-responses excluded.

1990. The new technology component of training expenditures is currently over 80 percent, up significantly from the 1981 level of about 60 percent. In the next ten years this percentage is expected to decline slightly to under 80 percent.

6.0 LABOUR RELATIONS ENVIRONMENT

This chapter discusses the labour relations environment in the industry.

6.1 Industrial Relations Environment: Historical

The Telephone Systems Industry had 75 percent of an estimated 29,960 employees involved in unions in 1982. The two major unions, Communications and Electronics, and Canadian Telephone Employees, accounted for 59 and 41 percent of unionized employees respectively.

6.2 Trends in Unionization

In contrast to the unionization rate for industry employers, just 20 percent of firms in the industry have union representation. The survey did not provide sufficient detail to estimate future trends in unionization in firms with union representation.

6.3 Technology Change Clauses

Survey respondents provided information on several technology change clauses in force at present. They all have a clause providing advance notice to workers of impending technological change. Other common elements of these clauses are such items as formal consultation procedures for dealing with change, consideration of worker seniority in cases of displacement, a general job security provision and aid to those displaced in the form of retraining and relocation.

These provisions exist with varying degrees of formality.

The Ontario Ministry of Labour provides further information on technology change clauses giving detail additional to the survey.

Table 15 provides information on several bargaining units in the province.

6.4 Management's Perception of their Union's Position on New Technology

Two firm respondents reported that the top union priority is job security for the membership. Another important consideration is that workers have the chance to retrain and become comfortable with new technology. However, they believe that some union leaders view the process of technological change with a certain degree of distrust despite the apparent absence of layoffs due to innovation to date.

This viewpoint is partially confirmed by the union comments. Because of the industry's history of ongoing technological change, they feel that they are accustomed to dealing with it. Union concerns about job security and technological change exist but the prime concern in this area stems from the industry's and the economy's potential for future growth.

6.5 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity and/or quality and adopting new technology.

Respondents indicate that production and sales targets are the subject of formal discussion at all corporate levels.

Productivity and quality are the subjects of formal discussion similar in prevalence to working group production decisions. Formal mechanisms to deal with new technology are less prevalent than productivity mechanisms.

TABLE 15

INDUSTRIAL RELATIONS: TELEPHONE SYSTEMS

UNION	NUMBER OF EMPLOYEES	MAJOR EMPLOYER*	LOCATION	TECHNICAL CHANGE CLAUSE IN AGREEMENT
COMMUNICATIONS AND ELECTRONICS	9,000	Bell Canada Craft and Service	Province-wide	Advance Notice, Consultation, Income Protection, Transfer Arrangements, Advance Notice of Lay-off or Termination, Severance Pay and Other Provisions.
	4,060	Traffic and Dining Service	Province-wide	Advance Notice, Consultation, Training, Income Protection, Joint Automation Committee, Relocation Allowances, Transfer Arrangements, Severance Pay and Other Provisions.
	234	Northern Telephone	Province-wide	Advance Notice, Consultation, Training, Income Protection, Transfer Arrangements and Severance Pay.
CANADIAN TELEPHONE EMPLOYEES	8,500	Bell Canada Office and Clerical	Province-wide	Consultation
	667	Communication Sales	Province-wide	Consultation
	20	Enterprises	Toronto	None
ELECTRICAL WORKERS (IBEW)	14	Kenora Town Corporation Telephone Unit	Kenora	Training

* Employer with a union agreement covering 14 employees or more. The union agreements above represent 99.9 percent of unionized employees.

SOURCE: Collective Bargaining Agreement Systems, Ontario Ministry of Labour.

6.6 Views on Involving Workers in Decisions on Adopting New Technology

Management and union leaders were asked how management should involve workers in decisions regarding the adoption of new technologies.

The most prominent element in firm respondents' replies is the importance of keeping employees informed. Some feel that employees have no role to play in the process of technological change while others believe that the time for worker involvement is during the implementation stage when the value of practical suggestions by employees should be high. However, others see workers as potentially having a broader role than this, providing information at an early stage in the planning process.

The union response leans towards this last viewpoint. Employees place priority on the need for early involvement to allow sensible reaction to coming changes. The union view also stresses belief in the usefulness of worker comment at all stages of change.

Results of Question 18

TABLE 16: TELEPHONE SYSTEMS AND INTERCONNECTS

SIC 544

Planning for Technological Change

Firms by Employment Size	Strategic Plan	Human Resource Plan		Capital Investment Plan		Perceived Integration Between Capital and Human Plans (1)
	Percent of Firms With Plan	Percent of Firms With Plan	Length of Planning Horizon	Percent of Firms With Plan	Length of Planning Horizon	
Total Firms	67	20	6 years	36	7 years	2.6

(1) Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

This chapter reports survey results regarding questions related to planning for technological change. A summary of these results appears in Table 16.

The survey indicates that about 70 percent of firms use strategic planning to decide where to place their emphasis in future development. In contrast, human resource planning occurs in 20 percent of firms. Capital investment planning to deal with new technology is undertaken by an estimated 36 percent of the industry. In both these types of planning, the planning horizon is six and seven years respectively. Finally, integration between human resource and capital investment planning is not high, due to the small percentage of firms using human resource planning.

SECTION II - TELEGRAPH AND CABLE SYSTEMS

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

This section of the report provides a historical analysis of trends in the Telegraph and Cable Systems Industry for the period 1971 to 1981 and 1982 to 1984.

The Telegraph and Cable Industry includes establishments primarily engaged in telecommunications, data transmission services and satellite communication services. The industry also includes establishments primarily engaged in providing teletype service, ticker tape service, telephoto service and telegraph communication service by wire or radio. The more modern name for the establishments included in SIC 545 is "Telecommunication Carriers". This report will therefore refer to these establishments as such.

There are some fundamental differences between telephone systems and the type of telecommunications carrier dealt with in this section. Where telephone systems provide telephone and other telecommunication services to business and residences and interconnect with one another, the other type of telecommunication carrier will, in addition, provide services and other communication facilities to other carriers; for instance Telesat leases channels on its Anik satellites for domestic use to telephone systems such as Bell Canada and Teleglobe Canada provides international links to domestic telecommunication carriers. However, the technology of both types of telecommunication carriers is the same, hence the ease with which they interconnect.

The most significant items of operating revenue (see Table D.8) in 1980 were leased circuits ($126.9 million) and telephone services ($100.6 million). Phone service accounts for a large proportion of operating revenue because the phone system is used for data

transmission and because of the inclusion of Teleglobe's international services. As yet, these companies may not transmit long distance voice signals. Hearings are now being held on this issue.

Table D.9 shows some key indicators for each of the major establishments in the Telecommunications Industry in Canada in 1980. A more detailed discussion of each of the major participants follows in the section on the market environment for telecommunications. Table D.9 does, however, indicate that CNCP Telecommunications is the largest telecommunication carrier in Canada, with 4,323 employees and $237.7 million in operating revenue in 1980. According to operating revenue statistics, CNCP Telecommunications had a 54 percent market share in 1980 followed by Teleglobe Canada (with 31 percent) and Telesat Canada (with 13 percent).

2.1 The Market Environment

This section will describe successively the companies active in this field, the regulatory framework, the impetus provided by technological innovation, and the resulting challenges for the companies.

2.1.1 The Principal Carriers

The main telecommunication carriers included in SIC 545 are CNCP Telecommunications, Teleglobe Canada and Telesat Canada; they operate throughout Canada. Another carrier, Ontario Northland Railway, also operates in Ontario, but is much smaller. The three main carriers are described below.

CNCP Telecommunications ('CNCP') is a separate company resulting from a partnership agreement between Canadian National Railways and Canadian Pacific Railways. CNCP Telecommunications provides private line service to large business users and a variety of data transmission

services, including a packet-switched network (Infoswitch). The company is headquartered in Toronto.

Teleglobe Canada is a Crown corporation of the federal government. Headquartered in Montreal, Teleglobe holds the monopoly for communications to countries other than the United States. Teleglobe is the Canadian participant to the organization that operates international communication satellites (Intelsat). Teleglobe also owns and operates a network of undersea cables jointly with foreign organizations.

Telesat Canada owns and operates communication satellites that serve the Canadian domestic market for a variety of telephone, telecommunications and broadcasting services. Bell Canada owns about 22 percent of Telesat; the rest of the equity belongs to other telcos and to the federal government. Telesat is headquartered in Ottawa. CNCP Telecommunications competes directly with Bell Canada. Teleglobe and Telesat are "carriers' carriers" and work with Bell Canada and other companies.

2.1.2 Lighter Regulation and Privatization

The three main carriers are regulated by the Canadian Radio-television and Telecommunications Commission ('CRTC'). Progressively over the years, CNCP has prepared the way for full competition in the marketplace. Currently, CNCP competes in selected segments of intercity transmission and in the sale of terminal equipment to business users (through its subsidiary Telecommunications Terminal Systems). CNCP is also part of a major CRTC hearing to open up public toll service to full competition.

Teleglobe Canada is one of many federal Crown agencies currently available for sale, in a privatization effort quite similar to that taking place in the United Kingdom.

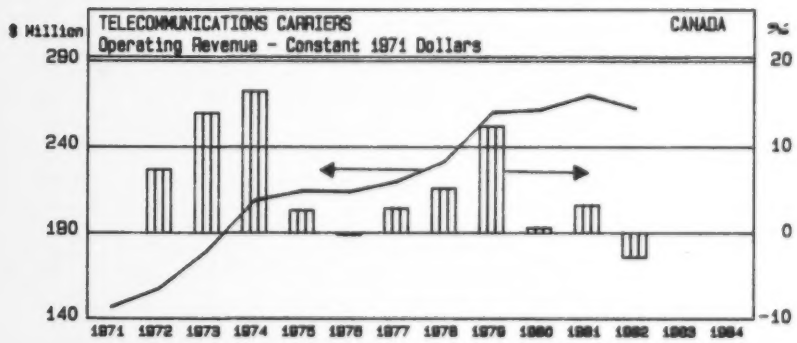
Bell Canada has announced its interest in acquiring Teleglobe, in a joint effort with other telephone companies across Canada. Teleglobe management has indicated that it would prefer to retain its monopoly status if and when privatization occurs.

Telesat Canada is currently barred from selling telecommunications services directly to large business end-users. Some United States' based satellite companies (Satellite Business Systems and American Satellite) have recently been authorized to access large business users directly, paving the way to bypassing the local loop monopoly.

2.2 Industry Trends

2.2.1 Aggregate Output

EXHIBIT 6



Operating revenue for Telecommunications Carriers increased from $146.4 million in 1971 to $493.0 million in 1981, showing an average annual increase of 12.9 percent. Operating revenues further increased in 1982 to $536.3 million.

In constant 1971 dollars, operating revenue grew from $146.4 million in 1971 to $269.7 million in 1981, experiencing an average annual growth rate of 6.3 percent. From 1981 to 1982 they fell 2.9 percent to $262.0 million (see Tables D.10 to D.13).

Operating revenue increased steadily between 1971 and 1981, with only a slight decrease of 0.2 percent in 1976. The increases were of larger magnitude in the early 1970's than in the late 1970's, with the exception of the 1979 increase of 12.4 percent.

2.2.2 Capital Investment

Capital investment data for SIC 544 (Telephone Systems) and SIC 545 (Telecommunications Carriers) are combined and have been outlined under SIC 544. (See pages 15 to 17 of this report).

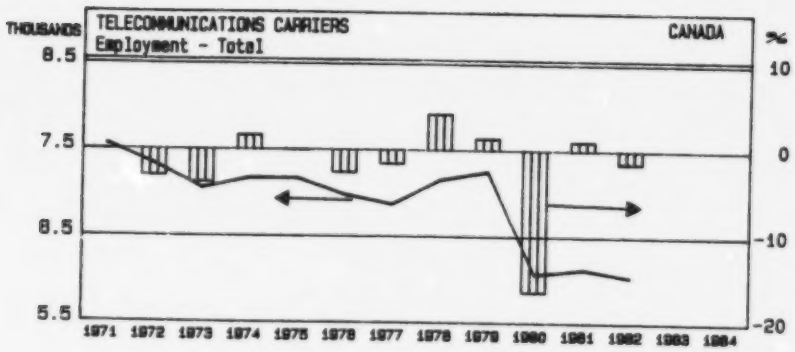
2.2.3 Employment

The discussion of employment includes an analysis of aggregate trends and occupational changes.

- Aggregate Trends

In this report two sources of employment data are used in order to provide the level of analysis required. Total employment trends are available at the Canada level only and are taken from Statistics Canada, Telecommunications Statistics, Cat. No. 56-201. This data series is used as it shows the year to year trend in annual employment. In order to analyze the employment trends by occupation, the Census of Canada has been used. However, this data is only available for the census years 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

EXHIBIT 7



Employment in Canada declined from the 1971 level of 7,553 to 6,118 in 1981 for an average rate of decline of 2.1 percent a year (see Tables D.10 and D.11). A further decline of 1.5 percent in 1982 brought the level to 6,027 workers.

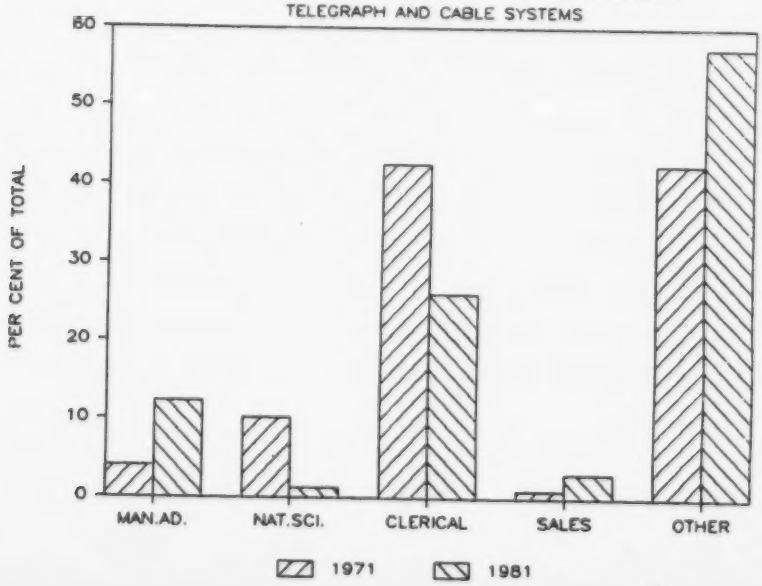
Over the 1971 to 1981 time period, employment has not experienced any significant increases, with the largest being 4.2 percent in 1978. The largest decrease was in 1980 (16.4 percent), when employment dropped to 6,055. Basically, the trend has been a couple of years of declines followed by a weak recovery and then further declines.

- Occupational Changes

EXHIBIT 8

EMPLOYMENT DISTRIBUTION

TELEGRAPH AND CABLE SYSTEMS



According to the census data in Table D.14, telegraph and cable systems in Ontario employed 2,405 people in 1981. This industry experienced an average annual growth rate of 1.3 percent between 1971 and 1981. Only two groups - Managerial, Administration and Related, and Other - grew as a proportion of the industry over the ten year period (see Exhibit 8, above). The largest contributor to growth of the Other category were the construction trades' occupations, employing 60.8 percent of the Other category in 1981.

At the broad occupational level the largest employment group was Clerical and Related with 625 employees (26 percent of total employment). This group was the only one showing a decline from 1971 levels, with a negative 3.6 percent average annual rate of change.

The highest average annual growth rate, 14.1 percent, belonged to Sales occupations, which accounted for only 3.1 percent of total employment. Managerial, Administrative and Related, which had 295 employees in 1981, also enjoyed a relatively high growth rate of 13.3 percent.

Natural Sciences, Engineering and Mathematics, with 14.6 percent of total employment, experienced a moderate average annual growth rate of 5.0 percent.

There is not much occupational data at the more detailed occupational level. A few points of interest; within Clerical and Related occupations, bookkeepers and accounting clerks (19.2 percent of clerical workers) experienced zero growth between 1971 and 1981. Within the Natural Sciences,

Engineering and Mathematics classification, electrical engineers, with 155 employees, had an average annual growth rate of 8.3 percent.

Women accounted for under 25 percent of total employment in 1981; this is down from 1971 levels when their share of employment was 28.3 percent (see Table D.15). The largest number of women were in Clerical and Related jobs (385). There was also the highest concentration of women in that group, 61.6 percent of employment. The number of Clerical and Related jobs, though, diminished by 120 over the decade.

The other occupational groups really did not offer any significant employment opportunity for women. In 1981, there were 15 women in Natural Sciences, Engineering and Mathematics, and the same number in Managerial, Administrative and Related positions. In both of these occupational groups, women's proportion of employment decreased from 1971 levels.

Sales positions showed the largest gain in jobs for women since 1971 (25). There were no women in Sales in 1971, but by 1981 they accounted for one-third of employment in that category.

Results of Question 3

TABLE 17: TELEGRAPH AND CABLE SYSTEMS SIC 545

Percent of Firms Planning to Adopt New Technologies by Employment Size (1)

Technologies	Before 1985 Total	1985-1990 Total	1990-1995 Total
CUSTOMER AND SERVICE DELIVERY TECHNOLOGIES			
Computer Service Order Processing	75	25	-
Computer Client Accounts	75	25	-
Automated Diagnostics	25	25	-
Customized Telecommunications Systems	25	-	-
Voice Synthesis Applications	0	25	25
Voice Recognition Applications	0	25	25
DESIGN TECHNOLOGIES			
Computer-Aided Design (CAD)	25	25	-
Computer-Aided Engineering (CAE)	50	-	-
OFFICE AUTOMATION TECHNOLOGIES			
Word Processing	100	-	-
Electronic Filing	0	100	-
Internal Data Base Management Systems	100	-	-
Local Area Networks (LANs)	0	100	-
Computerized Decision Support Systems	100	-	-
Voice Activated Computers	0	-	100
Artificial Intelligence/Expert Systems	0	75	75
Integrated Work Stations	25	75	-
TELECOMMUNICATIONS TECHNOLOGIES			
Private Automatic Branch Exchange (PABX)	50	50	-
Electronic Mail	50	50	-
Voice Mail	0	100	-
Facsimile with Built-In Microprocessor (FAX)	100	-	-
Satellite/Microwave Systems	100	-	-
Videotex	0	25	-
Video Conferencing	0	-	100
Fibre Optics	50	50	50
Other	0	50	25
OTHER TECHNOLOGIES			
4th Generation Computer Languages	0	75	-

(1) '0' used prior to 1985 to indicate have not adopted. '-' used for period 1985-1990 and 1990-1995 to indicate respondents, at the time of survey, are not planning to adopt this technology or 'don't know'. Responses are not mutually exclusive.

PART III - FUTURE TRENDS: THE SURVEY RESULTS

Part III of this study presents the survey results which discuss the firms' surveyed opinions as to future trends in technology adoption and employment impacts.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Telegraph and Cable Systems Industry and the factors driving the need for and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

As noted in the historical report, there is a great deal of new technology in use or coming into use in telecommunications operations. The focus in this chapter shifts away from new technology used in the communications process toward new technology used in the firms' internal operations. The industry has been active here too in pursuing the adoption of new technology in many different areas. Table 17 outlines the firms' acquisitions to date and their plans to 1995.

3.1.1 Customer and Service Delivery Technologies

The industry is well advanced in adopting the technologies available in customer service activities. The application of computers to service orders and client account records is being used by 75 percent of firms. Automated diagnostics and customized telecommunications systems have been introduced by 25 percent of firms and further purchases are planned for the 1985 to 1990 period. Firms also intend to introduce voice synthesis and recognition application between 1985 and 1995.

3.1.2 Design Technologies

The industry has already invested in computer assisted design and engineering systems to some extent. Firms plan further purchase of design apparatus in the years to 1990.

3.1.3 Office Automation Technologies

All firms in the industry report having introduced word processing, internal data base and computerized decision support systems. The next five years should see the purchasing of electronic filing systems, local area networks, artificial intelligence systems and integrated work stations. In the 1990's firms plan to extend their use of artificial intelligence and to widely adopt voice activated computers.

3.1.4 Telecommunications Technologies

The technologies most widely adopted to date in this area are facsimile machines and satellite or microwave systems, in use by all firms. Other technologies are in use now and will continue to be adopted in future. These include private automatic branch exchanges, electronic mail and fibre optics. Voice mail and videotex are planned for introduction in the 1985 to 1990 period, while video conferencing and fibre optics technologies are expected to be the focus of interest in the early 1990's.

3.1.5 Other Technologies

Fourth generation computer languages are projected to be adopted by 75 percent of firms in the 1985 to 1990 period.

3.2 Forces Driving the Need to Adopt New Technology

Firms are adopting new technology in response to four factors. These are:

- the need to increase productivity,
- the need to improve the firm's organizational capabilities,
- customer demands for new services and,
- growth opportunities, due in part to industry deregulation.

Improving organizational capability for these firms is equivalent to increasing efficiency or productivity. The focus is thus very strongly on the need to obtain increases in productivity from technological change.

Table 18 provides details of respondents' views.

3.3 Forces that Could Slow the Rate of Technology Adoption

The most important retarding factor in adopting new technology, according to respondents, is the limit on growth opportunities existing in part because of regulatory constraints, both in telegraph and cable systems and in telephone systems. Respondents' views are presented in Table 19.

A second important factor is the difficulty in financing purchase of equipment embodying new technology.

A third influence is the problem of inducing firms and nations to agree on standards for similar or compatible systems which would ideally be linked across international borders.

Results of Question 4

TABLE 18: TELEGRAPH AND CABLE SYSTEMS SIC 545

Most Important Factors Driving Need To Adopt New Technologies

Factor		Percent of Firms by Employment Size: Total Firms
COMPETITIVE PRESSURES	First	0
	Second	0
	Third	25
	Weighted Importance (1)	0.3
CUSTOMER DEMANDS FOR CHANGES	First	25
	Second	0
	Third	0
	Weighted Importance	0.8
INCREASE PRODUCTIVITY	First	50
	Second	0
	Third	0
	Weighted Importance	1.5
INCREASE QUALITY	First	0
	Second	25
	Third	0
	Weighted Importance	0.5
LOWER COSTS	First	0
	Second	25
	Third	0
	Weighted Importance	0.5
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	0
	Second	50
	Third	0
	Weighted Importance	1.0
ENTER NEW MARKETS/ GROWTH	First	25
	Second	0
	Third	0
	Weighted Importance	0.8
OBSOLESCENCE	First	0
	Second	0
	Third	25
	Weighted Importance	0.3
ALL OTHERS	First	0
	Second	0
	Third	50
	Weighted Importance	0.5

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 5

TABLE 19: TELEGRAPH AND CABLE SYSTEMS

SIC 545

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size: Total Firms
ABILITY TO FINANCE	First	50
	Second	25
	Third	0
	Weighted Importance (1)	2.0
COMPETITIVE ENVIRONMENT	First	25
	Second	0
	Third	50
	Weighted Importance	1.3
POOR ECONOMIC CONDITIONS	First	25
	Second	75
	Third	0
	Weighted Importance	2.3
LACK OF NEW TECHNOLOGY STANDARDIZATION	First	0
	Second	0
	Third	25
	Weighted Importance	0.3

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 4

TABLE 18: TELEGRAPH AND CABLE SYSTEMS SIC 545

Most Important Factors Driving Need To Adopt New Technologies

Factor		Percent of Firms by Employment Size: Total Firms
COMPETITIVE PRESSURES	First	0
	Second	0
	Third	25
	Weighted Importance (1)	0.3
CUSTOMER DEMANDS FOR CHANGES	First	25
	Second	0
	Third	0
	Weighted Importance	0.8
INCREASE PRODUCTIVITY	First	50
	Second	0
	Third	0
	Weighted Importance	1.5
INCREASE QUALITY	First	0
	Second	25
	Third	0
	Weighted Importance	0.5
LOWER COSTS	First	0
	Second	25
	Third	0
	Weighted Importance	0.5
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	0
	Second	50
	Third	0
	Weighted Importance	1.0
ENTER NEW MARKETS/ GROWTH	First	25
	Second	0
	Third	0
	Weighted Importance	0.8
OBSOLESCENCE	First	0
	Second	0
	Third	25
	Weighted Importance	0.3
ALL OTHERS	First	0
	Second	0
	Third	50
	Weighted Importance	0.5

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 5

TABLE 19: TELEGRAPH AND CABLE SYSTEMS SIC 545

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size: Total Firms
ABILITY TO FINANCE	First	50
	Second	25
	Third	0
	Weighted Importance (1)	2.0
COMPETITIVE ENVIRONMENT	First	25
	Second	0
	Third	50
	Weighted Importance	1.3
POOR ECONOMIC CONDITIONS	First	25
	Second	75
	Third	0
	Weighted Importance	2.3
LACK OF NEW TECHNOLOGY STANDARDIZATION	First	0
	Second	0
	Third	25
	Weighted Importance	0.3

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 1

TABLE 20: TELEGRAPH AND CABLE SYSTEMS — SIC 545

Operating Revenues in Ontario

Average Annual Compound Rate of Change (in Constant Dollars) (1)

Firms by Employment Size	Estimated 1982-1983	Estimated 1983-1984	Estimated 1984-1985	Expected 1985-1990	Expected 1990-1995
Total Firms	3.5	5.5	3.5	2.5	2.5

(1) Rounded to closest 0.5 %

4.0 INDUSTRY OUTLOOK FOR 1995

This chapter reviews the anticipated outlook for the industry in terms of aggregate output (i.e., revenue in Ontario), investment, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

Firms see the industry recovering from the pause in 1982. They expect growth of about 3.5 percent in 1985 after 1984's 5.5 percent increase. The industry anticipates growth of about 2.5 percent in the years to 1995. This view depends in part upon a continuing trend toward deregulation. Table 20 details industry views.

4.2 Investment Patterns

Respondents expect to devote virtually all investment funds to machinery and equipment and very little to construction in the years to 1995. The new technology component of machinery and equipment investment is expected to be approximately 95 percent. In contrast, the new technology component of construction expenditures is projected to be only about 38 percent.

4.2.1 Justifying Financial Investment in New Technology

As with other investment, new technology investment is subjected to formal tests of profitability. The industry appears to require a return on investment of about 16 percent. However, other criteria are used and there appears to be no individual criterion widely used for determining an investment's viability.

Results of Question 11a,b,c

TABLE 21: TELEPHONE AND CABLE SYSTEMS SIC 545

Most Important Factors Affecting The Firms' Employment in Ontario

Factor		Percent of Firms by Employment Size: Total Firms
INCREASE SALES/ INCREASE MARKET SHARE	First	25
	Second	0
	Third	0
	Weighted Importance (1)	0.8
INTRODUCTION OF NEW TECHNOLOGY	First	50
	Second	0
	Third	25
	Weighted Importance	1.8
SUCCESS IN FOREIGN MARKETS	First	0
	Second	25
	Third	0
	Weighted Importance	0.5
ABILITY TO COMPETE	First	25
	Second	0
	Third	0
	Weighted Importance	0.8
INDUSTRY-WIDE GROWTH	First	0
	Second	25
	Third	25
	Weighted Importance	0.8
ALL OTHERS	First	0
	Second	50
	Third	0
	Weighted Importance	1.0

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

4.2.2 Source of New Capital Spending

The industry expects to finance 100 percent of its anticipated investment programs from internal funds.

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate industry employment in Ontario.

4.3.1 Factors Affecting Employment

The introduction of new technology is the primary determinant of employment levels according to respondents. This includes the ongoing process of office automation listed in the "all other" categories on Table 21. A secondary concern is the level of future growth of market activity and the firms' ability to compete in the market place.

4.3.2 Employment Outlook

Respondents expect employment growth of approximately 2.5 percent in 1985, up from the 1.0 percent per annum growth between 1981 to 1984. Both of these rates represent a turnaround from the steady declines experienced in the 1970's, as described in the historical section of the report. Firms expect growth in employment of 2.5 percent per annum to continue to 1995. A similar rate of growth is projected by respondents for constant dollar operating revenues, suggesting that increases in labour productivity are unlikely over this period. Table 22 displays the employment profile.

Results of Question 11d

TABLE 22: TELEGRAPH AND CABLE SYSTEMS

SIC 545

Firms' Employment Trends in Ontario

Firms by Employment Size	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated Rate		Expected Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Total Firms	1.0	2.5	2.5	2.5

(1) Rounded to closest 0.5%.

4.3.3 Trends in Part-Time Work

Part-time employment in the industry is about 3 percent of total employment. No significant change is expected in future.

4.4 Changes in Occupational Structure

Table 23 shows trends in firms' occupational structure to 1995. Respondents' views suggest that there will be an increase in occupational share of:

- Managerial, Administrative and Related, and
- Sales positions.

The share of the Natural Sciences, Engineering and Mathematics group is currently slightly above the 1981 level, but should decline towards that level again in future. Clerical positions' share is expected to decline slightly to 1995 while the Other category is likely to remain stable at around 35 percent of total employment.

The table also shows where respondents expect gains or losses in shares to occur. For example, the decline in Engineering share should be concentrated in engineering technicians' and electrical engineers' positions. The decline in Clerical employees share in 1984 is primarily in the all other clerks category and is partly offset by the increase in general office clerks' share. Future declines, though moderate, are expected to be mostly among bookkeepers and accounting clerks.

Results of Question 12

TABLE 23: TELEGRAPH AND CABLE SYSTEMS SIC 545

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	18.4	19.8	19.8	19.9	20.1
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	14.3	15.0	15.0	14.6	14.5
• Electrical Engineers		+	0	-	0
• All Other Engineers		0	0	0	0
• Engineering Technicians and Technologists		0	0	-	-
• Draughtsmen		-	0	0	0
• Systems Analysts and Computer Programmers		+	0	0	0
• All Other Natural Science, Engineering and Mathematics		0	0	0	0
CLERICAL	30.8	27.2	27.3	27.2	27.0
• Clerical Supervisors		0	0	0	0
• Secretaries		0	0	0	0
• Typists/Clerk Typists (includes Word Processing Operators)		0	0	0	0
• Bookkeepers and Accounting Clerks		0	-	-	-
• EDP Equipment Operators		0	0	0	0
• General Office Clerks		+	+	0	0
• Telephone Operators		-	-	0	-
• Receptionists and Information Clerks		0	0	0	0
• All Other Clerks		-	0	0	0
SALES	2.5	3.4	3.4	3.6	3.7
OTHER OCCUPATIONS	34.0	34.6	34.5	34.7	34.7
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease 0 no change

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results on the employment effects of new technology in terms of skills match and requirements and impact on skill levels and job content.

5.1 Effects on Occupations

Table 24 summarizes firms' views on how technological change will affect occupational requirements. Respondents indicate that they expect an oversupply to develop in bookkeeping positions and perhaps for draughtsmen and general office clerks. Shortages are projected for managers and engineering technicians and are considered possible for several other occupations. These include several Engineering and Clerical occupations as well as Sales positions. Respondents were frequently cautious about expressing these views, as may be seen in the "no response" column. (This column includes respondents who expect relative balance between their occupation needs and anticipated availability.)

5.2 Likely Steps to Deal with Skills Oversupply

Respondents cite attrition as the most likely step to be used in reducing an oversupply of skills for all occupations. Secondary steps include upgrading of personal skills to make an employee eligible for similar work, retraining and lateral transfer. All these steps apply to Clerical positions only. Table 25 provides details.

5.3 Likely Steps to Deal with Skills Shortages

Firms expect to use retraining and recruiting to meet any shortages of skills which may develop in the next ten years. Other steps to be used selectively include contracting work out

Results of Question 6

TABLE 24: TELEGRAPH AND CABLE SYSTEMS SIC 545

Impact of Technology on Selected Occupations in Firms 1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	0	50	50
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Electrical Engineers	0	25	75
• All Other Engineers	0	0	100
• Engineering Technicians and Technologists	0	75	25
• Draughtsmen	25	0	75
• Systems Analysts and Computer Programmers	0	25	75
CLERICAL			
• Clerical Supervisors	0	25	75
• Secretaries	0	25	75
• Typists/Clerk Typists (includes Word Processing Operators)	25	50	25
• Bookkeepers and Accounting Clerks	50	0	50
• EDP Equipment Operators	0	25	75
• General Office Clerks	25	0	75
• Telephone Operators	0	0	100
• Receptionists and Information Clerks	0	25	75
SALES	0	33	67
OTHER OCCUPATIONS	0	33	67

Results of Question 7

TABLE 25: TELEGRAPH AND CABLE SYSTEMS SIC 545

Steps Firms Will Likely Take to Deal With an OVERSUPPLY of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Draughtsmen	Attrition	(1)	(1)
CLERICAL			
• Typists/Clerk Typists (includes Word Processing Operators)	Attrition	Upgrade	(2)
• Bookkeepers and Accounting Clerks	Attrition	Retrain	Lateral Transfer
• General Office Clerks	Attrition	(1)	(1)

(1) Only one step mentioned.
(2) only two steps mentioned.

Results of Question 8

TABLE 26: TELEGRAPH AND CABLE SYSTEMS SIC 545

Steps Firms Will Likely Take to Deal With a SHORTAGE of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Retrain	Recruit	(1)
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Electrical Engineers	Recruit	Contract Out	(1)
• Engineering Technicians and Technologists	Retrain	Recruit	Upgrade
• Systems Analysts and Computer Programmers	Recruit	Contract Out	(1)
CLERICAL			
• Clerical Supervisors	Retrain	Recruit	(1)
• Secretaries	Retrain	Recruit	(1)
• Typists/Clerk Typists (includes Word Processing Operators)	Retrain	Upgrade	(1)
• EDP Equipment Operators	Retrain	Recruit	(1)
• Receptionists and Information Clerks	Retrain	Recruit	(1)
SALES	Recruit	Retrain	(1)
OTHER OCCUPATIONS	Retrain	(2)	(2)

(1) Only two steps mentioned.
(2) Only one step mentioned.

for electrical engineering and systems analysis tasks and upgrading for engineering technicians and typists. Results of the survey by occupation are presented in Table 26.

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to judge the expected impact of new technology on individual occupations in terms of:

- skills required,
- time required to achieve proficiency, and
- knowledge of their firms' operations.

Respondents feel on balance that skill requirements are likely to increase for most occupations. This is most likely to be true for managers, clerical supervisors, secretaries, bookkeepers and sale persons. Only draughtsmen and engineers in the "all other engineers" area are considered candidates for possible declines in skill requirements.

Views on time to reach proficiency suggest that no change is likely in most cases. Increases are thought to be possible for clerical supervisors, bookkeepers and salespersons. Decreases may occur for draughtsmen, secretaries and perhaps engineering technicians.

Firms see knowledge requirements about company operations increasing in many positions spread across all groups. The most likely candidates are managers and secretaries. Several other occupations expect no change in knowledge necessary for full efficiency. Only sales persons are considered likely to experience decreases in knowledge requirements. Details of the expected influence of technological change on job content are presented in Table 27.

Results of Question 9

TABLE 27: TELEGRAPH AND CABLE SYSTEMS

SIC 545

Impact of Technology on Skill Levels and Job Content

(1) Percent of Firms

Occupations	Skills Required			Time to Achieve Proficiency			Knowledge of Firm's Operations		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	100	0	0	25	50	25	75	0	25
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Electrical Engineers	50	0	50	0	0	100	0	0	100
• All Other Engineers	0	50	50	0	0	100	0	0	100
• Engineering Technicians and Technologists	50	25	25	25	50	25	0	0	100
• Draughtsmen	0	50	50	0	50	50	50	0	50
• Systems Analysts and Computer Programmers	50	0	50	0	0	100	50	0	50
CLERICAL									
• Clerical Supervisors	100	0	0	50	0	50	50	0	50
• Secretaries	75	0	25	0	50	50	75	0	25
• Typists/Clerk Typists (includes Word Processing Operators)	50	0	50	0	0	100	50	0	50
• Bookkeepers and Accounting Clerks	100	0	0	50	0	50	50	0	50
• EDP Equipment Operators	50	0	50	0	0	100	0	0	100
• General Office Clerks	0	0	100	0	0	100	0	0	100
• Telephone Operators	50	0	50	0	0	100	50	0	50
• Receptionists and Information Clerks	0	0	100	0	0	100	0	0	100
SALES	100	0	0	67	0	33	33	67	0

+ increase - decrease 0 remain the same

(1) Non-responses excluded.

5.5 Training Costs and New Technology

Firms did not provide sufficient information to estimate at a total industry level either training costs as a proportion of labour costs or new technology related training costs as a percentage of total training costs. Those who did respond anticipate no change in training costs or the amount related to new technology in the coming decade.

6.0 LABOUR RELATIONS ENVIRONMENT

This chapter discusses the labour relations environment in the industry.

6.1 Industrial Relations Environment: Historical

The Ontario Ministry of Labour reports having records of collective bargaining agreements covering the following workers and firms in 1983:

- CNCP:
  - Communications and Allied Workers - 971 employees
  - Railway Clerks - 88 employees
- Ontario Northland Railway:
  - Railway Clerks
    - maintenance, construction and tele-operators - 116 employees
    - telegraphers - 69 employees

Data are not adequate to estimate the degree of unionization in Ontario from these figures.

6.2 Trends in Unionization

All of the firms surveyed reported having union representation. An estimated 43 percent of the industry's employees are reported to have union status as of 1984. The share of industry employment with union affiliation is expected to climb steadily to about 52 percent in 1995.

6.3 Technology Change Clauses

All firms report having a technology change clause in their collective bargaining agreements with workers. At least 50 percent of these clauses have the following provisions:

- notice to employees of impending change,
- consultation on adjusting to technological change,
- a joint committee of management and labour,
- job security for those displaced from their positions, and
- seniority consideration in retraining or relocating personnel.

Some contracts contain the option to be given a cash severance payment in case of displacement.

6.4 Management's Perception of their Union's Position on New Technology

Management views unions as being very positive towards innovation. They say that the innovative tradition in the industry has fostered this attitude over time. The unions' appreciation of the need to remain competitive is reported to be an influence as well. Chief concerns include job security for members and the opportunity to retrain if displaced. These concerns have frequently been handled in discussions and settlements within the context of the technology change clauses.

Union views are slightly more cautious than are management opinions of union views. While much consultation and compensation work is done to help adjust to the effects of technological change, there is some feeling that these effects are not yet well understood. Some of these effects include demands for increased flexibility as to work hours, relocation, job description and task assignments.

Secondly, they feel that there is, so far, inadequate consideration of the secondary effects of technological change on occupations indirectly related to the central point of change. Others tasks may change due to innovations in a seemingly unrelated area.

6.5 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity and/or quality and adopting new technology.

Respondents indicated that no formal mechanisms exist for setting production or sales targets above the working group level. Such mechanisms are more common for productivity or quality control where they are more widespread than for production or sales. No respondents report having a formal approach for worker participation in decisions on adopting new technology.

6.6 Views on Involving Workers in Decisions on Adopting New Technology

Management and union leaders were asked how management should involve workers in decisions regarding the adoption of new technologies.

Management views the potential for worker involvement in decision making leading to new technology as being very limited. The complex nature of the technology, employees' difficulty in helping to evaluate complicated investment alternatives and the international or intercorporate nature of some technology agreements are important factors narrowing the scope for worker participation in decision making. However, respondents stress that it is important to keep employees informed as early as

possible of impending changes and that workers can frequently have a significant role in deciding how to implement new procedures and introduce new equipment.

The union response is one of interest in participating in decision making as well as in worker adjustment activities and implementation decisions. However, the focus of interest for unions is still primarily on worker adjustment, aid and compensation. They feel that, too often, the burden of adjustment is on the worker and that some attention might usefully be devoted to trying to adopt new technology to human needs, that is, to make new technology more 'user friendly' than it has been.

Results of Question 18

TABLE 28: TELEGRAPH AND CABLE SYSTEMS

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Planning for Technological Change

Firms by Employment Size	Strategic Plan: Percent of Firms With Plan	Human Resource Plan: Percent of Firms With Plan	Human Resource Plan: Length of Planning Horizon	Capital Investment Plan: Percent of Firms With Plan	Capital Investment Plan: Length of Planning Horizon	Perceived Integration Between Capital and Human Plans (1)
Total Firms	100	100	7 years	100	14 years	3.8

(1) Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

This chapter reports survey results regarding questions related to planning for technological change. A summary of those results appears in Table 28.

All respondents report making use of strategic planning for future operations. They also use human resource planning and have capital investment plans for dealing with new technology. Furthermore, the planning horizon is 7 years in human resources and 14 years in capital investment. Integration between these two types of plans is estimated to be fairly high.

PART IV - APPENDICES

Part IV of this report presents the appendices referred to in Parts I and II.

These appendices are:

Appendix	Title	Reference
A	Firm Employment Size Categories Used in the Survey of the Telecommunications Industry	Part I
B	Questionnaire	Part I
	Responses by Question	Part III
	• Telephone Systems	
	• Telegraph and Cable Systems	
C	Reliability of the Sample	Part I
D	Historical Tables	Part II
Page D.1	• Telephone Systems	
Page D.9	• Telegraph and Cable Systems	

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE TELECOMMUNICATIONS INDUSTRY

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE TELECOMMUNICATIONS INDUSTRY

Size Categories Used to Stratify the Sample Frame		Size Categories Used to Weight and Report Survey Results	
Number of Employees			Number of Employees
20 - 49			
50 - 99		Small	50 - 199
100 - 199			
200 - 499			
500 - 999		Medium	200 - 999
1000 - 1499			
1500 - 2499			
2500 - 4999		Large	1,000 or more
5000 or more			

APPENDIX B

QUESTIONNAIRE

AND

RESPONSES BY QUESTION

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

TELEPHONE SYSTEMS
(SIC 544)
QUESTIONNAIRE

Currie, Coopers & Lybrand
Management Consultants

INTRODUCTION

Thank you for agreeing to participate in the study. It is being carried out for the Ontario Task Force on Employment and New Technology, a joint labour-management group. Their mandate is to examine the extent and nature of employment change likely to result from the introduction and application of new technology in Ontario over the next ten years.

You Will Receive The Survey Results
As a participant, you will receive a report on the survey results for your industry.

All Responses Will Be Confidential
All responses will be held in strictest confidence. Responses will be analysed and used only at an industry-wide level.

Both Organized Labour and Management Are Being Surveyed
Management and organized labour participants, in the case of unionized firms, will both receive a questionnaire. We realize that labour participants may not be able to answer some of the questions. In particular, they may find difficulty in answering questions: 10, 11, 12, 13 and 17.

Participants May Want to Consult Key Resource People in Responding
The questionnaire is not necessarily meant to be completed by only one respondent. It may be appropriate and even desirable for survey participants to consult other key resource people in their firm before responding to the questionnaire. Respondents should indicate on the Participant Information (p.4), the "principle respondent" and "other respondents" as well as the Section(s) of the questionnaire to which they contributed.

You Will Save Time if Information is Filled in Before the Interview
A number of questions relate to your firm's past or present workforce and future plans. We are requesting management respondents to provide accurate information from their organization's records in advance of the interview. This step will reduce the time needed for the actual interview and also make it more meaningful. The Participant Information (p.4) and the following questions should be filled in prior to the management interview: 3, 6 to 13 inclusive, 15 and 17.

Group Interviews Are Possible
In some cases the principle respondent may want to arrange a group interview between himself, key resource people and our consultant. We would welcome such an arrangement. This option is open to either management or labour participants.

You May Wish to Complete the Entire Questionnaire Before the Interview
The entire questionnaire could be completed in advance of the interview. If this is convenient, please do so. We would, however, still wish to spend a half-hour with you to review your responses.

Your "Best" Estimate
Where estimates are required, we are asking respondents to provide us with their "best estimate". Estimating future trends is difficult. Our premise is that an expert inside the organization is in the best position to make them, based on his or her knowledge of the firm's future direction.

EXHIBIT A

SELECTED OCCUPATIONS: TELECOMMUNICATIONS & CABLE, SIC 544, 545

MANAGERIAL, ADMINISTRATIVE & RELATED (includes senior and middle management and administrative support functions such as personnel officers, financial officers)

NATURAL SCIENCE, ENGINEERING & MATHEMATICS

Electrical Engineers
All Other Engineers
Draughtsmen
Engineering Technicians & Technologists
Systems Analysts & Computer Programmers

CLERICAL

All Clerical Supervisors
Secretaries
Typists/Clerk Typists (includes Word Processing Operators)
Bookkeepers & Accounting Clerks
EDP Equipment Operators
Receptionists & Information Clerks
Telephone Operators
General Office Clerks

SALES

SIC 545

SIC 544

The Study is Focusing on Selected Occupations

The Task Force for your industry is focusing on chosen major occupational groups and selected occupations within these major groups. These are listed in Exhibit A. The job titles and definitions being used are from the "Canadian Classification and Dictionary of Occupations, 1971" (CCDO). The CCDO is a universal system of job titles and descriptions. Our consultants are available to assist you or your staff in clarifying which of your firm's positions should be considered in the CCDO titles listed in Exhibit A.

Please Call If You Have Any Enquiries

Should you or your staff require any assistance, please call Sandra Skivsky of our firm or the consultant who will be interviewing you, at 366-1921.

Your Participation Is Appreciated

While we appreciate that your participation in the survey puts a demand on your time and organization, we would emphasize that your contribution will have an important impact on the results of this project.

PARTICIPANT INFORMATION

COMPANY NAME: _____

UNION NAME (If appropriate): _____

AFFILIATED ORGANIZATIONS: _____

MAIN ADDRESS: _____

TELEPHONE NUMBER: ( ) _____

BRIEF DESCRIPTION OF OPERATION IN ONTARIO

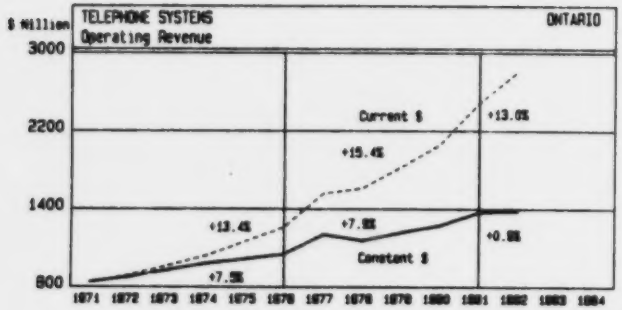
Divisions/Branches/Affiliates	Products/Services

SURVEY PARTICIPANTS

Name	Position	Number of Years With Company	Number of Years With Industry	Check (✓) Sections Answered II	III	IV	V	VI	VII
				☐	☐	☐	☐	☐	☐
(principal respondent)									
				☐	☐	☐	☐	☐	☐
(other respondents)									
				☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐

CHART 1

INDUSTRY-WIDE OPERATING REVENUE IN ONTARIO*



* Source: Statistics Canada, Telephone Systems, Cat. No. 56-203.

SIC 544

1. INDUSTRY-WIDE OPERATING REVENUE IN ONTARIO

Chart 1, opposite, illustrates operating revenue for Telephone Systems in ONTARIO in current dollars (dotted line) and in constant dollars (current dollars adjusted for price changes, solid line).

The rates shown for the first three time periods listed below are expressed in annual compound rates of change (in constant dollars).

Using these rates as a guide, please estimate the annual compound rates of change (in constant dollars) of your industry's revenue in ONTARIO for the next five periods listed.

Revenue in Ontario	Annual Compound Rate of Change (in constant dollars)
1971 to 1976	+7.5%
1976 to 1981	+7.9%
1981 to 1982	+0.9%

Your Estimates	(Indicate if + or -)
1982 to 1983?	____ %
1983 to 1984?	____ %
1984 to 1985?	____ %
1985 to 1990?	____ %
1990 to 1995?	____ %

SIC 544

2. INDUSTRY-WIDE OUTLOOK - EMPLOYMENT IN ONTARIO

The table below indicates total employment and annual compound rates of change for Telephone Systems in ONTARIO between 1976 and 1982. (Estimated from proceedings of CRTC hearings, March 30, 1984, Question 265).

Would you please indicate your estimates for the five following periods listed below (i.e., 1983-1995) for ONTARIO. Provide your estimates in actual numbers or in annual compound rates of change, whichever is easier.

For your information, total employment covers full-time, part-time, temporary, casual and contract - i.e., total "head count".

Total Employment in Ontario		Annual Compound Rates of Change	
1976	25,928		
1981	29,448	1976-1981	+ 2.6 %
1982	29,960	1981-1982	+ 1.7 %

	Your Estimates:			(Indicate if + or -)
1983?	_____	OR	1982-1983?	___ %
1984?	_____	OR	1983-1984?	___ %
1985?	_____	OR	1984-1985?	___ %
1990?	_____	OR	1985-1990?	___ %
1995?	_____	OR	1990-1995?	___ %

3. FIRM'S ADOPTION OF TECHNOLOGIES

The following questions refer to new technologies your firm has already or may adopt over the next ten years in ONTARIO.

3a. Please indicate the technologies that have already been adopted by your firm. Record your answer on Chart 3, opposite, under column 3a.

3b. Please indicate the technologies that will probably be adopted by your firm between 1985 and 1990. Record your answer on Chart 3, under column 3b. It may be appropriate to check more than one time period.

3c. Please indicate the technologies that will probably be adopted by your firm between 1991 and 1995. Record your answer on Chart 3, under column 3c. It may be appropriate to check more than one time period.

CHART 3

TECHNOLOGIES ADOPTED OR TO BE ADOPTED BY THE FIRM

	3a ADOPTED IN 1984 OR BEFORE	3b WILL BE ADOPTED BETWEEN 1985-1990?	3c WILL BE ADOPTED BETWEEN 1991-1995?
1. CUSTOMER & SERVICE DELIVERY			
Computerized Service Order Processing	☐	☐	☐
Computerized Client Accounts	☐	☐	☐
Automated Diagnostics (Remote Maintenance)	☐	☐	☐
Customized Telecommunication Systems e.g., _____	☐	☐	☐
Voice Synthesis Applications	☐	☐	☐
Voice Recognition Applications	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
_____			
2. DESIGN TECHNOLOGIES			
Computer-Aided Design (CAD)	☐	☐	☐
Computer-Aided Engineering (CAE)	☐	☐	☐
Any Others? _____	☐	☐	☐
_____			
3. OFFICE AUTOMATION (Own Operations)			
Word Processing	☐	☐	☐
Electronic Filing	☐	☐	☐
Internal Data Base Management Systems	☐	☐	☐
Local Area Networks (LANs)	☐	☐	☐
Voice Activated Computers	☐	☐	☐
Computerized Decision Support Systems	☐	☐	☐
Artificial Intelligence/Expert Systems	☐	☐	☐
Fully Integrated Work Stations	☐	☐	☐
Any Others ? _____	☐	☐	☐
_____			
4. TELECOMMUNICATIONS (Own Operations)			
PABX (voice/data)	☐	☐	☐
Electronic Mail	☐	☐	☐
Voice Mail	☐	☐	☐
Facsimile with Microprocessor (FAX)	☐	☐	☐
Satellite/Microwave Systems	☐	☐	☐
Videotex (e.g., Telidon)	☐	☐	☐
Video Conferencing	☐	☐	☐
Fibre Optics	☐	☐	☐
Any Others ? _____	☐	☐	☐
_____			
5. ANY OTHER TECHNOLOGIES			
4th Generation Computer Languages	☐	☐	☐
_____	☐	☐	☐
_____	☐	☐	☐
_____	☐	☐	☐
HAVE/WILL NOT ADOPT ANY NEW TECHNOLOGIES IN THIS PERIOD	☐	☐	☐

4. FORCES DRIVING THE FIRM'S NEED FOR NEW TECHNOLOGIES OVER THE NEXT 10 YEARS

4a. What is the **single most important driving factor** in your firm's internal or external environment which could accelerate your firm's **need to adopt** these new technologies over the next 10 years in ONTARIO?

_____
_____
_____

4b. What is the **second most important factor** likely to accelerate your firm's need to adopt these new technologies?

_____
_____
_____

4c. And what is the **third most important factor**?

_____
_____
_____

5. FACTORS AFFECTING THE FIRM'S RATE OF TECHNOLOGY ADOPTION OVER THE NEXT 10 YEARS

5a. What is the **single most important factor** in your firm's internal or external environment that could <u>slow down</u> the speed at which your firm will adopt these new technologies over the next 10 years in ONTARIO?

_____
_____
_____

5b. What is the **second most important factor** that could slow down your firm's adoption of these new technologies?

_____
_____
_____

5c. And what is the **third most important factor**?

_____
_____
_____

6. IMPACT OF TECHNOLOGY ON OCCUPATIONS OVER THE NEXT 10 YEARS

The following questions attempt to determine impacts on specific occupations you expect to be caused by the adoption of new technologies in your firm over the next 10 years in ONTARIO.

6a. Please indicate the **occupations** in which your firm is likely to have an **oversupply of people** over the next 10 years as a result of the adoption of these new technologies. Record your answer on Chart 6, opposite, under column 6A.

6b. Please indicate the **occupations** in which you expect your firm will have a **shortage of the skills** required to cope with these new technologies. Record your answer on Chart 6, under column 6B.

SIC 544

CHART 6

IMPACT OF TECHNOLOGIES ON SELECTED OCCUPATIONS IN YOUR FIRM OVER THE NEXT 10 YEARS

	6a OCCUPATIONS WITH AN OVERSUPPLY OF SKILLS	6b OCCUPATIONS WITH A SHORTAGE OF THE REQUIRED SKILLS
MANAGERIAL, ADMINISTRATIVE & RELATED	☐	☐
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Electrical Engineers	☐	☐
• All Other Engineers	☐	☐
• Draughtsman	☐	☐
• Engineering Technicians & Technologists	☐	☐
• Systems Analysts & Computer Programmers	☐	☐
CLERICAL		
• All Clerical Supervisors	☐	☐
• Secretaries	☐	☐
• Typists/Clerk Typists	☐	☐
• Bookkeepers & Accounting Clerks	☐	☐
• EDP Equipment Operators	☐	☐
• Receptionists & Information Clerks	☐	☐
• Telephone Operators	☐	☐
• General Office Clerks	☐	☐
SALES	☐	☐
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____	☐	☐
_____	☐	☐
_____	☐	☐

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7. ACTIONS TO DEAL WITH OVERSUPPLY OF SKILLS IN FIRM OVER NEXT 10 YEARS

The following questions relate to the actions your firm will likely take to deal with the oversupply of people in your firm resulting from the adoption of these new technologies in ONTARIO.

7a. For each occupation with a potential oversupply of skills (as you indicated in Q.6a), please identify the steps your firm will likely take that will affect the largest number of people in that occupation. Record your answers on Chart 7, opposite, under column 7a.

In answering this and the following question, please consider the possible actions listed below as well as any other possible action not in the list but that your firm is likely to take.

Possible Actions

- Attrition
- Early Retirement
- Layoffs
- Relocation (geographic)
- Shorter hours/work week
- Job sharing
- Change from full-time to part-time
- Retraining
- Lateral transfer
- Upgrading
- Downgrading
- Etc., etc.

7b. Again, for each of these occupations, identify the step your firm may take that will affect the second largest number of people in that occupation. Record on Chart 7, under column 7b.

CHART 7

STEPS YOUR FIRM WILL LIKELY TAKE
TO DEAL WITH OVERSUPPLY OF SKILLS OVER NEXT 10 YEARS

OCCUPATIONS	7a STEPS THAT WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	7b STEPS THAT WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Electrical Engineers		
• All Other Engineers		
• Draughtsmen		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
CLERICAL		
• All Clerical Supervisors		
• Secretaries		
• Typists/Clerk Typists (includes Word Processing Operators)		
• Bookkeepers & Accounting Clerks		
• EDP Equipment Operators		
• Receptionists & Information Clerks		
• Telephone Operators		
• General Office Clerks		
SALES		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

8. STEPS TO ACQUIRE THE NEW SKILL REQUIREMENTS OVER THE NEXT 10 YEARS

The following questions are intended to identify the most likely steps your firm may take to acquire the new skill requirements associated with the new technologies over the next 10 years in ONTARIO.

8a. Please indicate, for each occupation with a potential shortage of the new skill requirements (as you indicated in Q6b), the step your firm will likely take that will affect the largest number of people in that occupation. Record your answers on Chart 8, column 8a.

Please consider the possible actions listed below as well as any other action (not listed) that your firm is likely to take.

Likely Steps

- Retraining
- Relocation
- Upgrading
- Increased overtime of firm's skilled people
- Recruiting full-time skilled people
- Recruiting part-time skilled people
- Contracting work out
- Etc., etc.

8b. Please indicate, for each occupation, the step your firm may take that will affect the second largest number of people in that occupation. Record your answers in column 8b.

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CHART 8

STEPS YOUR FIRM WILL TAKE
OVER NEXT 10 YEARS TO ACQUIRE THE NEW SKILL REQUIREMENTS

OCCUPATIONS	8a STEP WHICH WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	8b STEP WHICH WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Electrical Engineers		
• All Other Engineers		
• Draughtsmen		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
CLERICAL		
• All Clerical Supervisors		
• Secretaries		
• Typists/Clerk Typists		
• Bookkeepers & Accounting Clerks		
• EDP Equipment Operators		
• Receptionists & Information Clerks		
• Telephone Operators		
• General Office Clerks		
SALES		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

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9. NATURE OF IMPACT ON SKILLS AND JOB CONTENT OVER THE NEXT TEN YEARS

The following questions are meant to identify the nature of the impact on selected occupations in ONTARIO.

9a. For selected occupations in your firm, please indicate how the new technologies will affect each in their daily work. That is, will their daily work require greater skill (+), less skill (-), or about the same skill (0) as they currently require? Record your answers on Chart 9, opposite, under Column 9a.

9b. Please indicate whether the new skills they require will demand more time (+), less time (-), or about the same time (0) to achieve the proficiency that they will need. Record your answers on Chart 9, column 9b.

9c. Please indicate whether, in using these new technologies, these occupations will require more knowledge (+) of the company's operations, less knowledge (-), or about the same (0) amount of knowledge as is currently required to perform their daily tasks. Record your answers on Chart 9, under 9c.

CHART 9

IMPACT OF TECHNOLOGY ON SKILL LEVELS AND JOB CONTENT

	9a SKILLS REQUIRED (+, -, 0)	9b TIME TO ACHIEVE PROFICIENCY (+, -, 0)	9c KNOWLEDGE OF COMPANY'S OPERATIONS (+, -, 0)	COMMENTS
MANAGERIAL, ADMINISTRATIVE, & RELATED	___	___	___	___
NATURAL SCIENCE, ENGINEERING & MATHEMATICS				
• Electrical Engineers	___	___	___	___
• All Other Engineers	___	___	___	___
• Draughtsmen	___	___	___	___
• Engineering Technicians & Technologists	___	___	___	___
• Systems Analysts & Computer Programmers	___	___	___	___
CLERICAL				
• All Clerical Supervisors	___	___	___	___
• Secretaries	___	___	___	___
• Typists/Clerk Typists	___	___	___	___
• Bookkeepers & Accounting Clerks	___	___	___	___
• EDP Equipment Operators	___	___	___	___
• Receptionists & Information Clerks	___	___	___	___
• Telephone Operators	___	___	___	___
• Gener l Office Clerks	___	___	___	___
SALES	___	___	___	___
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?				
_____	___	___	___	___
_____	___	___	___	___

10. TRAINING/RETRAINING

These questions are about the current and future importance of training and retraining in your organization.

10a. Please indicate what were your firm's total training costs as a percent of total labour costs in 1981. Record your answer on Chart 10, line 10a.

Training costs include the costs of internally or externally provided training programs, classroom and on-the-job workshops, vouchers or tuition credits, provided by your firm, which are intended to train employees to perform their jobs or to retrain employees to assume new or alternate jobs. Labour costs include all wages, salaries and benefits. (e.g., $\frac{\text{Total Training Costs}}{\text{Total Labour Costs}} \times 100 = 1.0\%$)

10b. Please indicate what your firm's total training costs as a percent of total labour costs will be in 1984 (to year end). Record your answer on line 10b.

10c. What do you estimate for 1985, (line 10c)?

10d. What do you estimate it will be in 1990, (line 10d)?

10e. What do you estimate it will be in 1995, (line 10e)?

10f. For each year on Chart 10, (line 10a to 10e), please indicate what percent of total training costs in each year have or will go towards training people to adapt to the new technologies.

CHART 10

TRAINING COSTS OF YOUR ORGANIZATION

			As a Percent of Total Labour Costs	Percent of Total Training Costs Directly Related to New Technologies
10a.	1981?	Actual	___%	___%
10b.	1984?	Estimate	___%	___%
10c.	1985?	Estimate	___%	___%
10d.	1990?	Estimate	___%	___%
10e.	1995?	Estimate	___%	___%

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11. FIRM'S EMPLOYMENT TRENDS

In this section, we would like to determine how the firm's employment levels in ONTARIO are likely to change over the next 10 years.

11a. To begin, considering all possible factors in your firm's internal and external environment, what is the **single most important factor** which will have an impact on your firm's level of employment in ONTARIO over the next 10 years? _____

_____

11b. The **second most important factor**?_____

_____

11c. The **third most important factor**?_____

_____

11d. Please indicate **total employees** (includes full-time, temporary, contract, casual, seasonal and part-time employment) in your organization in ONTARIO for 1971, 1981 and 1984 from your employment records. Record your answers on Chart 11, column 11d.

Please estimate future total employment in your organization in ONTARIO for 1985, 1990 and 1995.

11e. Please indicate the **percent** of your total employment in ONTARIO that are **part-time employees** (i.e., less than normal, full, work week), for 1981 and 1984. Record your answers on Chart 11, column 11e.

Also in column 11e, please estimate part-time employees as a percent of total employees in ONTARIO for 1985, 1990 and 1995.

11f. Please translate your total ONTARIO employment (include full-time, part-time, casual, temporary, seasonal) into a full-time equivalent (F.T.E.) figure for your firm for 1981 and 1984 in column 11f.

Also in column 11f, please estimate total employment in terms of a full-time equivalent (F.T.E.) for 1985, 1990 and 1995.

By F.T.E. we mean a normal, full, work week for a normal, full year. F.T.E. can be measured in a variety of ways depending on whatever is normal for your firm or industry. For example, if expressed in hours of work per year one FTE might range from 1750 to 2000 hours of work a year depending on the length of the normal work week (e.g., 35 hours/week x 50 weeks = 1750 hours, 40 hours/week x 50 weeks = 2000 hours.)

CHART 11

FIRM'S EMPLOYMENT TRENDS IN ONTARIO

	11d TOTAL EMPLOYMENT IN ONTARIO	11e PART-TIME EMPLOYEES AS A % OF TOTAL EMPLOYMENT	11f TOTAL EMPLOYMENT IN FULL-TIME EQUIVALENT (F.T.E.)
Actual Figures			
1971?	_____		
1981?	_____	_____ %	_____ FTE
1984?	_____	_____ %	_____ FTE
Your Estimates			
1985?	_____	_____ %	_____ FTE
1990?	_____	_____ %	_____ FTE
1995?	_____	_____ %	_____ FTE

12. CHANGES IN EMPLOYMENT STRUCTURE

This section is intended to measure the changes in the employment structure of your firm in ONTARIO between 1981 and 1995.

12a. Please indicate the actual percentage share of <u>each</u> occupation listed as a percent of your firm's total employment in ONTARIO in 1981. Record your answer on Chart 12, column 12a.

12b. Please indicate the actual percentage share of <u>each</u> selected occupation listed as a percent of your firm's total employment in ONTARIO in 1984. Record your answer in column 12b.

12c. Please estimate the same for each selected occupation in 1985. Record in column 12c.

12d. Please estimate the same for each selected occupation in 1990. Record in column 12d.

12e. Please estimate the same for each selected occupation in 1995. Record in column 12e.

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CHART 12

TRENDS IN FIRM'S OCCUPATIONAL STRUCTURE BETWEEN 1981 AND 1995

	OCCUPATIONS AS A PERCENT OF TOTAL EMPLOYMENT OF THE FIRM IN ONTARIO					
	12a Actual 1981	12b Actual 1984	12c Estimate 1985	12d Estimate 1990	12e Estimate 1995	
	%	%	%	%	%	
MANAGERIAL, ADMINISTRATIVE, & RELATED						1a
NATURAL SCIENCES, ENGINEERING & MATHEMATICS						2a
• Electrical Engineers						
• All Other Engineers						
• Draughtsmen						
• Engineering Technicians & Technologists						
• Systems Analysts & Computer Programmers						
• All Other Natural Science, Engineering & Mathematics (not listed above)						
CLERICAL						3a
• All Clerical Supervisors						
• Secretaries						
• Typists/Clerk Typists						
• Bookkeepers & Accounting Clerks						
• EDP Equipment Operators						
• Receptionists & Information Clerks						
• Telephone Operators						
• General Office Clerks						
• All Other Clerks (not listed above)						
SALES						4a
ALL OTHER OCCUPATIONS						5a
* FIRM'S TOTAL EMPLOYMENT IN ONTARIO (1+2+3+4+5 = 100%)	100%	100%	100%	100%	100%	

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13. EMPLOYMENT STRUCTURE BY SEX

The following questions refer to your firm's employment in ONTARIO by sex for each specific occupation listed in Chart 13.

13a. Please provide the percentage split between male and female of your employees in ONTARIO by each occupation in 1981. Record your answer on Chart 13, column 13a.

13b. Please provide the percentage split between male and female employees by occupation in ONTARIO in 1984. Record your answer in Column 13b.

CHART 13

EMPLOYMENT STRUCTURE BY SEX AND OCCUPATION IN ONTARIO

	13a 1981 EMPLOYMENT MALE	FEMALE	TOTAL	13b 1984 EMPLOYMENT MALE	FEMALE	TOTAL
MANAGERIAL, ADMINISTRATIVE & RELATED	___% +	___%	=100%	___% +	___%	=100%
NATURAL SCIENCE, ENGINEERING & MATHEMATICS						
• Electrical Engineers	___% +	___%	=100%	___% +	___%	=100%
• All Other Engineers	___% +	___%	=100%	___% +	___%	=100%
• Draughtsmen	___% +	___%	=100%	___% +	___%	=100%
• Engineering Technicians & Technologists	___% +	___%	=100%	___% +	___%	=100%
• Systems Analysts & Computer Programmers	___% +	___%	=100%	___% +	___%	=100%
CLERICAL						
• All Clerical Supervisors	___% +	___%	=100%	___% +	___%	=100%
• Secretaries	___% +	___%	=100%	___% +	___%	=100%
• Typists/Clerk Typists	___% +	___%	=100%	___% +	___%	=100%
• Bookkeeping & Accounting Clerks	___% +	___%	=100%	___% +	___%	=100%
• EDP Equipment Operators	___% +	___%	=100%	___% +	___%	=100%
• Receptionists & Information Clerks	___% +	___%	=100%	___% +	___%	=100%
• Telephone Operators	___% +	___%	=100%	___% +	___%	=100%
• General Office Clerks	___% +	___%	=100%	___% +	___%	=100%
SALES	___% +	___%	=100%	___% +	___%	=100%
FIRM'S TOTAL EMPLOYEES IN ONTARIO	___% +	___%	=100%	___% +	___%	=100%

14. ORGANIZED LABOUR IN YOUR FIRM IN ONTARIO

14a. Does your firm have any workers in ONTARIO covered by a collective labour agreement(s)?

Yes ☐ No ☐ If no, go on to Question 14c.

14b. If yes, what percent of your firm's total employment in ONTARIO is currently (1984) unionized?

____%

14c. What percent of your firm's total employment in ONTARIO do you estimate will be unionized by 1985, 1990 and by 1995?

- 1985? ____%
- 1990? ____%
- 1995? ____%

14d. If you expect an increase in the percent of total employment that will be unionized, please indicate the specific occupational groups within which you expect the increase will take place.

_____

_____

15. ORGANIZED LABOUR AND TECHNOLOGY CHANGE

If any of the employees in your firm in ONTARIO are represented by a union, please answer the following series of questions. If none of the workers in your firm in ONTARIO are unionized, please go on to Question 16, p. 22.

15a. Please indicate the name of the union(s) in your firm in ONTARIO Record your answers on Chart 15, on line 15a.

15b. On line 15b, please indicate the number of the firm's employees in ONTARIO in each union.

15c. On line 15c, indicate the worker groups in your firm the union(s) represents.

15d. On line 15d, check ☑ if the contract(s) has a technology change clause(s).

15e. On line 15e, check ☑ if the technology change clause(s) covers any of the following:

- Notice/Disclosure
- Consultation/Participation
- Joint Technology Change Committee
- Job Security
- Seniority
- Other (please specify).

15f. On line 15f, indicate whether the clause(s) is effectively administered. If your answer is "NO", please explain your answer.

CHART 15

ORGANIZED LABOUR IN ONTARIO

	(name of union)	(name of union)	(name of union)
15a. Name of Unions in Organization			
15b. Number of Organization's Employees in Each Union			
15c. Worker Groups Represented by Each Union			
15d. Does Union(s) Contract(s) Have a Technology Change Clause(s)?			
YES	☐	☐	☐
NO	☐	☐	☐
15e. Check ☑ if Technology Change Clause(s) Includes:			
• Notice/Disclosure	☐	☐	☐
• Consultation/Participation	☐	☐	☐
• Joint Technology Change Committee	☐	☐	☐
• Job Security	☐	☐	☐
• Seniority	☐	☐	☐
• Other _____ (specify)	☐	☐	☐
15f. Is the Clause Effectively Administered?			
YES	☐	☐	☐
NO	☐	☐	☐
If 'NO', explain			

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15g. In general, what has been the union's position on the adoption of new technologies in your firm? Please explain.

_____

_____

_____

_____

_____

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16. THE NATURE OF WORKER INVOLVEMENT IN THE PROCESS OF TECHNOLOGY ADOPTION

The following questions are on the nature of the relationship between workers and management in your firm as decisions are made on the adoption of new technology.

16a. Does your firm have a formal mechanism for worker participation in any of the following? Please Check ☑ Yes or No

	YES	NO
• Setting production and/or sales targets:		
- at company level?	☐	☐
- at division/plant level?	☐	☐
- at department/area level?	☐	☐
- at working group level?	☐	☐
• Improving productivity/quality?	☐	☐
• Adoption of new technology?	☐	☐

16b. In your opinion, to what extent and how should management involve workers in decisions regarding the adoption of new technologies? Please comment.

_____

_____

_____

_____

_____

_____

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17. FUTURE CAPITAL INVESTMENTS

17a. Please indicate how much, in today's dollars, your firm plans to spend on construction of structures and buildings in ONTARIO over the period 1985 to 1990 and over the period 1991 to 1995. Record your answer on Chart 17, column 17a.

17b. What percent of this spending can be directly attributed to the adoption of new technologies? Record under column 17b.

17c. Would you indicate how much, in today's dollars, your firm plans to spend on machinery and equipment over the period 1985 to 1990 and over the period 1991 to 1995 in ONTARIO. Record under column 17c.

17d. What percent of this spending on machinery and equipment will be for new technologies? Record under column 17d.

17e. Please indicate what criterion your firm will likely use to justify the financial investment in the new technologies.

Pay-back period ☐ _____ If Yes, how long?

Return on investment ☐ _____ If Yes, what rate?

Other _____ (specify) ☐ _____ Please elaborate

17f. Considering now your total capital investment in new technology over the next 10 years, what percent will be funded through internal funds and what percent will be funded through external funds?

Internal funds ___%

External funds ___%

100%

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CHART 17

CAPITAL INVESTMENT PLANS

IN ONTARIO

	INVESTMENT IN STRUCTURES & BUILDINGS		INVESTMENT IN MACHINERY & EQUIPMENT	
	17a	17b	17c	17d
	IN TODAY'S DOLLARS (In Thousands $)	% DIRECTLY RELATED TO NEW TECHNOLOGY	IN TODAY'S DOLLARS (In Thousands $)	% FOR NEW TECHNOLOGY
1985 to 1990?	$_____	_____%	$_____	_____%
1991 to 1995?	$_____	_____%	$_____	_____%

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18. PLANNING FOR CHANGES IN TECHNOLOGY

These questions ask about your firm's plans for adopting new technologies in ONTARIO.

18a. Does your firm currently have a long-term strategic plan?

Yes ☐ No ☐

18b. Does your firm have a plan to deal with future human resource needs?

Yes ☐ No ☐ If no, go to Question 18d.

18c. Up to what year has your firm planned for its human resource needs?

_____
(WRITE IN YEAR)

18d. Does your firm have a capital investment plan dealing with the adoption of new technologies?

Yes ☐ No ☐ If no, go to Question 19. on p. 25.

18e. Up to what year has your firm planned for its capital requirements?

_____
(WRITE IN YEAR)

18f. On a scale of 1 to 5, please indicate to what extent these two plans (capital investment and human resource plans) are integrated?

(Please circle answer)

NOT AT ALL INTEGRATED	1	2	3	4	5	HIGHLY INTEGRATED

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19. Please indicate below any other comments on the issue of employment and new technology you wish to make.

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

SIC 544

TELEPHONE SYSTEMS AND INTERCONNECTS

Number of Firms and Unions Responding by Question

Question		Firms	Unions	Question		Firms	Unions
Question 1	1982-1983	7	1	Question 12	a,b,c,d,e	8	1
	1983-1984	7	1				
	1984-1985	7	1				
	1985-1990	7	1	Question 13		*	*
	1990-1995	7	1				
Question 2		*	*	Question 14	a	8	1
					b	3	1
					c	7	1
Question 3	a,b,c	8	1		d	0	0
Question 4	a,b,c	8	1	Question 15	a	3	1
					b	3	1
					c	*	*
Question 5	a,b,c	8	1		d	3	1
					e	2	1
					f	2	1
Question 6	a,b	8	1		g	3	0
Question 7	a	3	1	Question 16	a	8	1
	b	1	1		b	6	1
Question 8	a	6	1	Question 17	a	8	0
	b	6	1		b	8	0
					c	8	0
					d	8	0
Question 9	a	8	1		e	8	0
	b	8	1		f	7	0
	c	8	1				
				Question 18	a	8	1
Question 10	a,b,c,d,e	8	1		b	8	1
					c	3	1
Question 11	a,b,c,	8	0		d	8	1
	d	8	0		e	4	1
	e	6	0		f	3	1
	f	7	0				

* Data not used and therefore, number of responses not reported.

TELEGRAPH AND CABLE SYSTEMS

Number of Firms and Unions Responding by Question

Question		Firms	Question		Firms
Question 1	1982-1983	3	Question 12	a,b,c,d,e	3
	1983-1984	3			
	1984-1985	3			
	1985-1990	3	Question 13		*
	1990-1995	3			
Question 2		*	Question 14	a	3
				b	3
				c	3
Question 3	a,b,c	3		d	2
Question 4	a,b,c	3	Question 15	a	3
				b	3
				c	1
Question 5	a,b,c	3		d	3
				e	3
				f	3
Question 6	a,b	3		g	3
Question 7	a	2	Question 16	a	3
	b	2		b	3
Question 8	a	3	Question 17	a	3
	b	3		b	3
				c	3
				d	3
Question 9	a	3		e	3
	b	3		f	3
	c	3			
			Question 18	a	3
Question 10	a,b,c,d,e	2		b	3
				c	3
Question 11	a,b,c,	3		d	3
	d	3		e	3
	e	3		f	3
	f	3			

* Data not used and therefore, number of responses not reported.

APPENDIX C

RELIABILITY OF THE SAMPLE

SAMPLE RELIABILITY

The sample reliability is summarized with other sample and population characteristics in "Table 1". The sample was selected as a three stage stratified random sample. The purpose of this stratification was to reduce the error variance in the measurement of organization size by increasing the homogeneity of each group of organizations within each strata.

The first stage consisted in creating two industry sectors (i.e. manufacturing and services). The second stage involved dividing up each industry sector into nine and fourteen industrial sub-classes respectively and according to Standard Industrial Classification codes (see Table 1). The third stage was to further stratify each SIC into three more homogeneous size groups:

Manufacturing Sector	Service Sector
Small 20- 99 employees	20-199 employees
Medium 100-499 employees	200-999 employees
Large 500+ employees	1,000+ employees

Exceptions to these three size groupings are as follows:

SECTOR	ORGANIZATION SIZE EXCLUSION
Manufacturing Sector	
291 Iron & Steel Mills	less than 500
321 Aircraft & Aircraft Parts	less than 50
Service Sector	
701 Banks and Trusts	less than 50
721 General and Life Insurance	less than 50
735 Insurance Brokers	less than 50
909 Federal Government	less than 500
931 Provincial Government	less than 200
951 Local Government	less than 500

Overall, the sample yields a relatively high reliability level in reflecting the employment level of those sectors surveyed. For instance, the sample for Telephone Systems and Interconnects yields a minimum confidence level of about 90 percent with an associated allowable error of 23 percent. That is, we would expect that the estimated employment level for the sector has a 90 percent chance of being within $\pm$ 23 percent of the actual employment level found in the frame. Or stated alternatively, if 100 independent random samples were drawn, in 90 of these samples we would expect to have an estimated employment level within $\pm$ 23 percent of the actual employment level found in the sample frame.

For Telegraph and Cable Systems, the sample yields a minimum confidence level of about 90 percent with an associated allowable error of 20 percent. That is, we would expect that the estimated employment level for the sector has a 90 percent chance of being within $\pm$ 20 percent of the actual employment level found in the frame. Or stated alternatively, if 100 independent random samples were drawn, in 90 of these samples we would expect to have an estimated employment level within $\pm$ 20 percent of the actual employment level found in the sample frame.

TABLE 1: SUMMARY - SELECTED SERVICE INDUSTRIES

SAMPLE FRAME AND SAMPLE

SIC	SIC NAME	UNIVERSE		SAMPLE FRAME				SAMPLE				
		Number of Firms	Number of Employees	Firm Size Cut Off	Number of Firms	Number of Employees	Share of Universe	Number of Firms	Number of Unions	Number of Employees	Reliability Level (min.) (Percent)	Allowable Error (Percent)
701	Chartered Banks	68	64,200	50	16	60,300	94	8		43,883	95	5
701	Trust Companies	41	20,000	50	22	19,000	95	6		8,466	90	15
721	Life Insurance	45	31,200	$10 MM	26	28,200	90	6		6,355	95	5
721	General Insurance	94	20,000	$10 MM	51	19,000	95	8		2,128	95	9
735	Insurance Brokers	2,737	31,600	50	45	6,300	20	8		1,213	90	11
909	Federal Government	67	91,000	500	22	69,000	76	8	2	28,350	90	11
931	Provincial Government	37	84,000	200	19	67,000	80	8		37,599	90	11
951	Local Government	837	107,474	500	39	83,782	78	10	7	23,832	90	13
544	Telephone Systems and Interconnects	111	30,423	20	37	29,430	97	8	1	26,444	90	23
545	Telegraph and Cable Systems	4	2,543	20	4	2,543	100	3	1	2,116	90	20
631	Food Stores	n.a.	87,600	100	45	85,000	97		Expert Interviews Only			
642	General Merchandise Stores	n.a.	92,000	100	12	76,000	83		Expert Interviews Only			
853	Computer Services	n.a.	16,775	20	41	11,800	70	6		291	90	17
867	Management and Business Consultants	n.a.	10,975	20	40	5,900	54	8		1,070	95	6

APPENDIX D

HISTORICAL TABLES

TELEPHONE SYSTEMS PAGE D.1

TELEGRAPH AND CABLE SYSTEMS PAGE D.9

TABLE D.1

MAJOR SERVICES OFFERED BY THE TELEPHONE INDUSTRY IN ONTARIO AND QUEBEC IN 1982

	Revenues in 1982 Million of Dollars
LOCAL SERVICE REVENUE:	
Charges to customers	2,037.3
Coin telephones	61.1
Local private line service	63.8
Other local revenue	6.8
TOTAL	2,169.4
TOLL SERVICE REVENUE:	
Message toll revenue	1,883.0
Wide area telephone service (WATS)	226.5
Toll private line service	257.6
Other toll service revenue	11.3
Less: Charges payable to connecting systems for toll services	37.6
TOTAL	2,340.9
MISCELLANEOUS OPERATING REVENUE:	
Directory advertising & sales	4.7
Plant & building rental	53.4
Other	150.7
TOTAL	208.9
Less: Uncollectable operating revenue	41.0
TOTAL	4,678.1

SOURCE: Statistics Canada, Telephone Systems, Cat. No. 56-203.

TABLE 02

TELEPHONE SYSTEMS (SIC 544)
ONTARIO
Current Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
OPERATING REVENUES ($ Million)	648.8	723.7	820.1	924.1	1,048.8	1,215.3	1,557.6	1,613.4	1,831.2	2,044.6	2,488.9	2,811.5		
CAPITAL INVESTMENT ($ Million) (SIC 544 + SIC 545)														
CONSTRUCTION	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	245.0	266.4	337.4	339.2	358.9	241.7	304.4
MACHINERY & EQUIPMENT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	394.1	443.6	500.6	588.0	599.6	596.7	597.5
TOTAL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	639.1	710.0	838.0	927.2	958.5	838.4	901.9
EMPLOYMENT#	n.a.	n.a.	n.a.	n.a.	n.a.	25,928	26,897	27,107	28,417	28,942	29,448	29,960		

n.a. - not available
Estimated from Proceedings of CRTC Hearings, March 30, 1984, Question 265, assuming Ontario Bell employees are 95% of total.

SOURCE: Statistics Canada, TELEPHONE SYSTEMS, Cat. No. 56-203 and PRIVATE AND PUBLIC INVESTMENT IN CANADA, Cat. No. 61-205.

TABLE D3

TELEPHONE SYSTEMS (SIC 544)
ONTARIO
PER CENT CHANGE
Current Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
OPERATING REVENUE	11.5	13.3	12.7	15.7	13.7	28.2	3.6	13.5	12.7	20.6	13.0		
CAPITAL INVESTMENT													
CONSTRUCTION	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	8.7	26.7	0.5	5.8	-32.7	25.9
MACHINERY & EQUIPMENT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	12.6	12.8	17.5	2.0	-0.5	0.1
TOTAL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	11.1	18.0	10.6	3.4	-12.5	7.6
EMPLOYMENT	n.a.	n.a.	n.a.	n.a.	n.a.	3.7	0.8	4.8	1.8	1.7	1.7		

SOURCE: Calculated from Table D2 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D4

TELEPHONE SYSTEMS (SIC 544)
ONTARIO
Constant 1971 Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
OPERATING REVENUE ($ Million)	648.8	697.2	770.0	837.8	883.3	932.7	1,132.8	1,070.6	1,155.3	1,228.2	1,361.5	1,373.5		
CAPITAL INVESTMENT ($ Million)														
CONSTRUCTION	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	135.6	134.5	152.1	136.9	132.1	85.0	103.6
MACHINERY & EQUIPMENT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	220.5	225.5	230.8	242.9	229.4	221.5	210.7
TOTAL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	356.1	360.0	382.9	379.8	361.5	306.5	314.3
EMPLOYMENT	n.a.	n.a.	n.a.	n.a.	n.a.	25,928	26,897	27,107	28,417	28,942	29,448	29,960		

n.a. - not available

NOTE: REVENUE data deflated by the Implicit Price Index for Gross Domestic Product for SIC 544 and CAPITAL INVESTMENT deflated by the Implicit Price Indexes for Business Non-Residential Construction and Machinery and Equipment.

SOURCE: Publications as outlined in Table D1. Also Statistics Canada, GROSS DOMESTIC PRODUCT BY INDUSTRY, Cat. No. 61-005 and NATIONAL INCOME AND EXPENDITURE ACCOUNTS, Cat. No. 13-201.
Calculations and forecast deflators by Economics Practice, Currie, Coopers & Lybrand.

TABLE D5

TELEPHONE SYSTEMS (SIC 544)
ONTARIO
PER CENT CHANGE
Constant 1971 Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
OPERATING REVENUE	7.5	10.4	8.8	5.4	5.6	21.5	-5.5	7.9	6.3	10.9	0.9		
CAPITAL INVESTMENT, ONTARIO													
CONSTRUCTION	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-0.8	13.1	-10.0	-3.5	-35.7	21.9
MACHINERY & EQUIPMENT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2.3	2.4	5.2	-5.6	-3.4	-4.9
TOTAL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.1	6.4	-0.8	-4.8	-15.2	2.5
EMPLOYMENT	n.a.	n.a.	n.a.	n.a.	n.a.	3.7	0.8	4.8	1.8	1.7	1.7		

SOURCE: Calculated from Table D4 by Economics Practice, Currie, Coopers & Lybrand.

TABLE D.6

OCCUPATIONAL INDICATORS: TELEPHONE SYSTEMS

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
I	TOTAL INDUSTRY	37,920	4.9
II	TWO DIGIT LEVEL		
	CLERICAL AND RELATED	16,370	3.0
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	3,145	7.2
	SALES	1,075	8.9
	MANAGERIAL, ADMINISTRATIVE AND RELATED	4,690	18.2
III	FOUR DIGIT LEVEL		
	CLERICAL AND RELATED		
	Telephone Operators	3,745	(1.4)
	Other Clerical and Related, n.e.c.	2,490	3.4
	General Office Clerks	1,670	3.4
	Bookkeepers and Accounting Clerks	1,890	10.3
	TOTAL	16,370	3.0
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
	Clerical Engineers	1,180	4.0
	TOTAL	3,145	7.2
	MANAGERIAL, ADMINISTRATIVE AND RELATED		
	Management Transport and Communications Operations	1,500	31.1
	TOTAL	4,690	18.2

() Indicates decline.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.7

OCCUPATIONAL INDICATORS: TELEPHONE SYSTEMS

RANKING BY INCREASE IN FEMALE REPRESENTATION

		FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I.	TOTAL INDUSTRY	19,110	51.8	50.4	6,975
II.	TWO DIGIT LEVEL				
	SALES	590	29.3	54.9	455
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	700	6.1	22.3	605
	MANAGERIAL, ADMINISTRATIVE AND RELATED	1,700	23.3	36.2	1,495
	CLERICAL AND RELATED	14,600	90.3	89.2	3,575
III.	FOUR DIGIT LEVEL				
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
	Electrical Engineers	160	2.5	13.6	140
	TOTAL	700	6.1	22.3	605
	MANAGERIAL, ADMINISTRATIVE AND RELATED				
	Management, Transport and Communications Operations	420	5.0	28.0	415
	TOTAL	1,700	23.3	36.2	1,495

TABLE D.7 cont'd

OCCUPATIONAL INDICATORS: TELEPHONE SYSTEMS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
CLERICAL AND RELATED				
Telephone Operators	3,605	98.8	96.3	(640)
General Office Clerks	1,565	95.8	93.7	420
Other Clerical and Related, n.e.c.	2,290	92.7	92.0	635
Bookkeepers and Accounting Clerks	1,720	94.4	91.0	1,050
TOTAL	14,600	90.3	89.2	3,575

() Indicates decline.

NOTE: Females employed in 1981 is calculated from percent of total.
Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.8

MAJOR SERVICES OFFERED BY TELECOMMUNICATION CARRIERS

	Revenues in 1980 ($ millions)
Telephone	100.6
Cable, wireless and radio messages	30.1
Leased circuits	126.9
Other leased plant	78.7
Other non-transmission	68.2
Miscellaneous	34.7
TOTAL	439.2

SOURCE: Statistics Canada, Telecommunications Statistics, Cat. No. 56-201.

TABLE D.9

MAJOR TELECOMMUNICATION CARRIERS IN CANADA IN 1980

	Employment Number	Cost of Property Before Depreciation	Operating Revenue	Net Income Before Tax
		$ million		
CNCP Telecommunications	4,323	474.0	237.7	21.2
Teleglobe Canada	1,312	312.0	135.6	71.8
Telesat Canada	407	366.1	57.8	18.1
Other	13	3.6	8.1	0.4
TOTAL	6,055	1,155.7	439.2	111.5

SOURCE: Statistics Canada, Telecommunications Statistics, Cat. No. 56-201.

TABLE D10

TELECOMMUNICATION CARRIERS (SIC 545)
1971 - 1984
Current Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
OPERATING REVENUE, CANADA ($ Million)	146.4	163.2	190.7	230.1	259.1	278.3	302.1	348.3	411.8	439.2	493.0	536.3		
CAPITAL INVESTMENT, ONTARIO ($ Million) (SIC 544 + SIC 545)														
CONSTRUCTION	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	245.0	266.4	337.4	339.2	358.9	241.7	304.4
MACHINERY & EQUIPMENT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	394.1	443.6	500.6	588.0	599.6	596.7	597.5
TOTAL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	639.1	710.0	838.0	927.2	958.5	838.4	901.9
EMPLOYMENT, CANADA	7,553	7,323	7,047	7,163	7,162	6,973	6,863	7,150	7,247	6,055	6,118	6,027		

n.a. - not available

SOURCE: Statistics Canada, TELECOMMUNICATIONS STATISTICS, Cat. No. 56-001 and 56-201; and PRIVATE AND PUBLIC INVESTMENT IN CANADA, Cat. No. 61-205.

TABLE D11

TELECOMMUNICATION CARRIERS (SIC 545)
1971 - 1984
PER CENT CHANGE
Current Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
OPERATING REVENUE, CANADA	11.5	16.9	20.7	12.6	7.4	8.6	15.3	18.2	6.7	12.2	8.8		
CAPITAL INVESTMENT, ONTARIO													
CONSTRUCTION	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	8.7	26.7	0.5	5.8	-32.7	25.9
MACHINERY & EQUIPMENT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	12.6	12.8	17.5	2.0	-0.5	0.1
TOTAL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	11.1	18.0	10.6	3.4	-12.5	7.6
EMPLOYMENT, CANADA	-3.0	-3.8	1.6	0.0	-2.6	-1.6	4.2	1.4	-16.4	1.0	-1.5		

SOURCE: Calculated from Table D10 by Economics Practice, Currie, Coopers & Lybrand.

TABLE D12

TELECOMMUNICATION CARRIERS (SIC 545)
1971 - 1984
Constant 1971 Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
OPERATING REVENUE, CANADA	146.4	157.2	179.1	208.6	214.1	213.6	219.7	231.1	259.8	261.3	269.7	262.0		
CAPITAL INVESTMENT, ONTARIO ($ Million)														
CONSTRUCTION	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	135.6	134.5	152.1	136.9	132.1	85.0	103.6
MACHINERY & EQUIPMENT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	220.5	225.5	230.8	242.9	229.4	221.5	210.7
TOTAL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	356.1	360.0	382.9	379.8	361.5	306.5	314.3
EMPLOYMENT, CANADA	7,553	7,323	7,047	7,163	7,162	6,973	6,863	7,150	7,247	6,055	6,118	6,027		

n.a. - not available

NOTE: REVENUE data deflated by the Implicit Price Index for Gross Domestic Product for SIC 544 (not available for SIC 545) and CAPITAL INVESTMENT deflated by the Implicit Price Indexes for Business Non-Residential Construction and Machinery and Equipment.

SOURCE: Publications as outlined in Table D10. Also, Statistics Canada, GROSS DOMESTIC PRODUCT BY INDUSTRY, Cat. No. 61-005 and NATIONAL INCOME AND EXPENDITURE ACCOUNTS, Cat. No. 13-201. Calculations and forecast deflators by Economics Practice, Currie, Coopers & Lybrand.

TABLE D13

TELECOMMUNICATION CARRIERS (SIC 545)
1971 - 1984
PER CENT CHANGE
Constant 1971 Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
OPERATING REVENUE, CANADA	7.4	13.9	16.5	2.6	-0.2	2.9	5.2	12.4	0.6	3.2	-2.9		
CAPITAL INVESTMENT, ONTARIO													
CONSTRUCTION	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-0.8	13.1	-10.0	-3.5	-35.7	21.9
MACHINERY & EQUIPMENT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2.3	2.4	5.2	-5.6	-3.4	-4.9
TOTAL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.1	6.4	-0.8	-4.8	-15.2	2.5
EMPLOYMENT, CANADA	-3.0	-3.8	1.6	0.0	-2.6	-1.6	4.2	1.4	-16.4	1.0	-1.5		

SOURCE: Calculated from Table D12 by Economics Practice, Currie, Coopers & Lybrand.

TABLE D.14

OCCUPATIONAL INDICATORS: TELEGRAPH AND CABLE SYSTEMS

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
I	TOTAL INDUSTRY	2,405	1.3
II	TWO DIGIT LEVEL		
	CLERICAL AND RELATED	625	(3.6)
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	350	5.0
	MANAGERIAL, ADMINISTRATIVE AND RELATED	295	13.3
	SALES	75	14.1
III	FOUR DIGIT LEVEL		
	CLERICAL AND RELATED		
	Bookkeepers and Accounting Clerks	120	0.0
	TOTAL	625	(3.6)
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
	Architectural and Engineering Technologists and Technicians	105	2.8
	Electrical Engineers	155	8.3
	TOTAL	350	5.0

() Indicates decline.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.15

OCCUPATIONAL INDICATORS: TELEGRAPH AND CABLE SYSTEMS

RANKING BY INCREASE IN FEMALE REPRESENTATION

		FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I.	TOTAL INDUSTRY	565	28.3	23.5	(35)
II.	TWO DIGIT LEVEL				
	CLERICAL AND RELATED	385	56.1	61.6	(120)
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	15	7.0	4.3	0
	MANAGERIAL, ADMINISTRATIVE AND RELATED	15	11.8	5.1	5
	SALES	25	0.0	33.3	25
III.	FOUR DIGIT LEVEL				
	CLERICAL AND RELATED				
	Bookkeepers and Accounting Clerks	65	54.2	54.2	0
	TOTAL	385	56.1	61.6	(120)
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
	Electrical Engineers	5	7.1	3.2	0
	Architectural and Engineering Technologists and Technicians	0	0.0	0.0	0
	TOTAL	15	7.0	4.3	0

() Indicates decline.

NOTE: Females employed in 1981 is calculated from percent of total.

SOURCE: Census data, Ontario Ministry of Labour.

FINAL REPORT AND APPENDICES OF THE ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

Final Report — Employment and New Technology

Appendices:

1. Labour Market Trends in Ontario, 1950-1980
2. Occupational Employment Trends in Ontario, 1971-1981
3. Emerging New Technology, 1985-95: Framework for a Survey of Firms
4. Employment and New Technology in Ontario's Manufacturing Sector: A Summary of Selected Industries
5. Employment and New Technology in the Iron and Steel Industry
6. Employment and New Technology in the Metal Fabricating Industry
7. Employment and New Technology in the Machinery and Equipment Industry
8. Employment and New Technology in the Aircraft and Aircraft Parts Industry
9. Employment and New Technology in the Communications Equipment Industry
10. Employment and New Technology in the Office, Store and Business Machine Industry
11. Employment and New Technology in the Plastic Processing Industry
12. Employment and New Technology in Ontario's Service Sector: A Summary of Selected Industries
13. Employment and New Technology in the Chartered Banks and Trust Industry
14. Employment and New Technology in the Insurance Industry
15. Employment and New Technology in the Government Services Industry
16. Employment and New Technology in the Telecommunications Industry
17. Employment and New Technology in the Retail Trade Industry
18. Employment and New Technology in the Computer Services and Management Consulting Industry
19. Industry-Sector and Occupational Employment in Ontario, 1985-1995
20. Technological Change, Productivity, and Employment: Studies of the Overall Economy